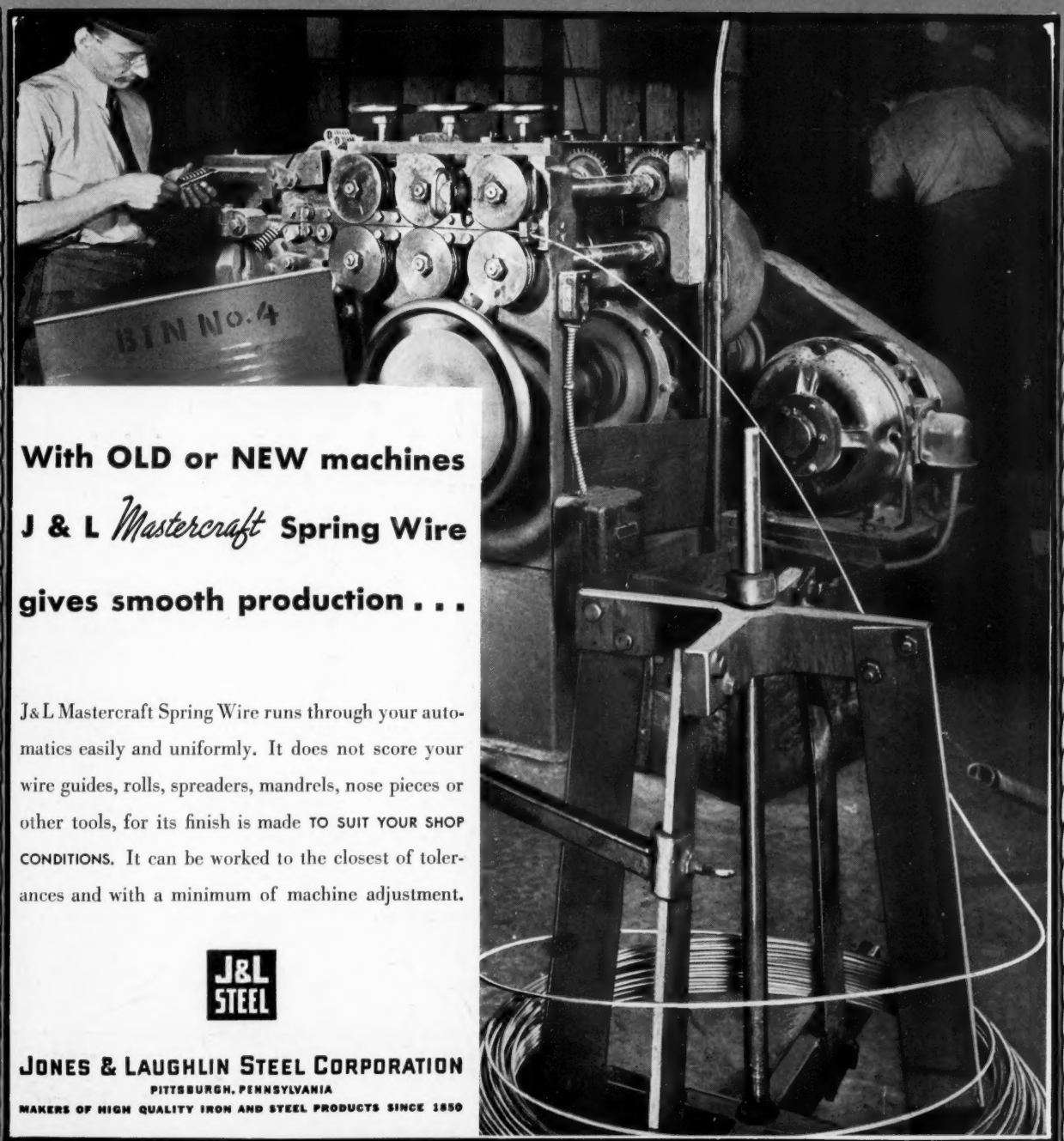
WIRE AND WIRE PRODUCTS

APRIL 1940



With OLD or NEW machines

J & L *Mastercraft* Spring Wire

gives smooth production . . .

J&L Mastercraft Spring Wire runs through your automatics easily and uniformly. It does not score your wire guides, rolls, spreaders, mandrels, nose pieces or other tools, for its finish is made TO SUIT YOUR SHOP CONDITIONS. It can be worked to the closest of tolerances and with a minimum of machine adjustment.

J&L STEEL

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH, PENNSYLVANIA

MAKERS OF HIGH QUALITY IRON AND STEEL PRODUCTS SINCE 1850

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

SPRINGTIME IN THE ROCKIES . . .

Springtime is a once-a-year occurrence everywhere . . . except right in your own plant. Winter or summer, spring or fall, "springtime" to you is NOW . . . the year-round production of uniform springs that meet specifications exactly. And right now is an opportune time to investigate what Torrington Spring Machines can do for you in stepping-up profits through their ability to produce more springs per machine hour—springs formed to a new high degree of perfection. Send us your sample springs or drawings. Our guaranteed production figures may mean important savings.

Model W-125 Segment Type Spring Coiler illustrated has wire diameter range from .080" to .207". Wire length per spring from 0" to 74" (with special gearing for smaller wire, 0" to 147").

The Torrington Universal Spring Coiler produces all of the usual compression and extension springs, and, in addition, will coil many types of torsion springs. A special attachment, which is applicable to all Torrington machines, increases production of torsion springs with remarkable accuracy of extended ends.

Spring Making Machines by

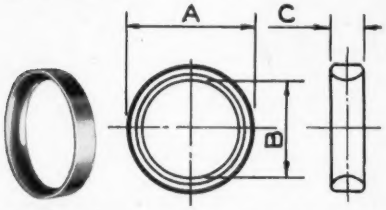
TORRINGTON

ENGINEERED AND MANUFACTURED BY THE TORRINGTON MANUFACTURING CO. of TORRINGTON, CONNECTICUT

Carboloy Rings Used As Guides On Wire Weaving Machines

The ability of cemented carbides to stand up for long periods of use when subject to abrasion has resulted in numerous wear-resistant applications for this material. Most recent of these is the use of Carboloy rings to guide the wire in wire weaving machines.

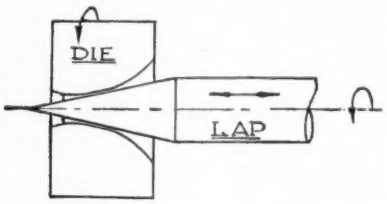
Standard Carboloy rings are now available for this, and other purposes, in the following sizes:



DETAILS NO.	SPECIFICATIONS (inches)		
	A	B	C
A	.227	.147	.072
B	.275	.180	.085
C	.315	.190	.093
D	.355	.225	.110
E	.370	.250	.120
F	.419	.295	.130
G	.480	.240	.140
H	.584	.430	.160
I	.675	.495	.180
J	.910	.690	.240

Controlling Surface Finish In Carboloy Dies

Correct finish on the Carboloy die approach is an important factor since this largely controls die life and the surface finish of the wire, bar or tube drawn.

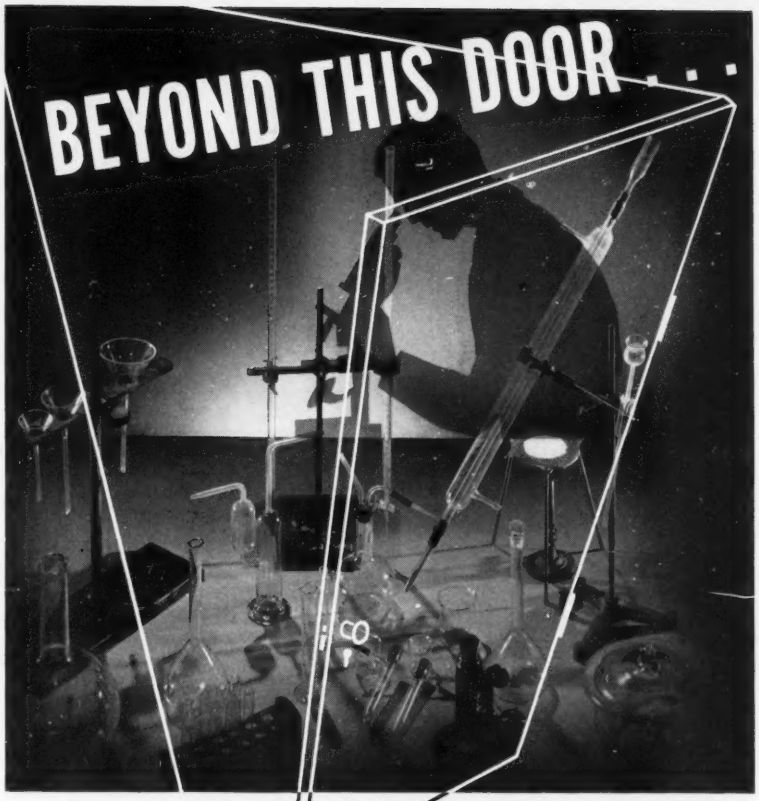


The necessary smooth approach can be easily obtained, when the correct procedure is followed. The die should be revolved at a speed of 1600-2100 r.p.m. and the lap at 200-400 r.p.m., with the lap supported at the rear and moved back and forth. Pressure of the lap against the die surface must be controlled so that pressure is light to provide a grinding action and prevent lapping compound from being forced out from between lap and work.

Under these conditions the lapping action results in a "criss-cross" type of lapped surface which is smooth and free from circumferential lapping marks in the die approach. The land or bearing is similarly lapped, using a straight lap. With the Roos Semi-Automatic Polisher, the above lapping action is obtained automatically.

Carboloy Drill For Maintenance Work Drills Holes In Concrete, etc., 75% Faster

Tip your maintenance man off to the Carboloy Masonry Drill. Drills concrete, tile, brick, slate, porcelain, etc., 75% faster than old methods. Send him leaflet GT-103.



. . . IT'S TOMORROW

Time never quite catches up with the men in our Research Laboratories. They deal largely with the possibilities of tomorrow. Their job is to obsolete the present, to constantly seek *better* methods, *better* equipment, *better* ways to make *better* Carboloy.

Often of far-reaching importance are the things they do. They impregnated Carboloy with diamond particles . . . and now those who dress grinding wheels have a diamond dresser that requires no resetting—no expensive stones . . . they applied this same material to the mining field—and it bids fair to revolutionize core drilling practice . . . they took microscopic particles of carbide—100 trillion to a pound of Carboloy—and *"split them in two"* to produce grades of Carboloy having an order of performance and life never before attained. . . . *NOW* they're perfecting a special extrusion process that turns out Carboloy *by the yard*—replaces 300-ton hydraulic presses. Things of this order they have done to mould "visions" into realities.

The "Tomorrows" of these men have made many things possible *today*. Carboloy is no longer just a cutting tool or a wire drawing die. It plays a part not only in *making* products but also has become an *actual part of* many products and machines. As a wear-resistant part, Carboloy is found in oil well pumps, spray guns, bread slicing machines, hydraulic equipment, business machines, refrigerating machines, saw sharpeners, machine tools, communication equipment, fish rods, etc. It helps to make such things as rayon, baby food, tomato juice, carbon resistors and coated welding rods.

Carboloy uses exceed the boundaries of your machine shop or wire mill. Carboloy is the Metal of Tomorrow with a thousand and one uses Today!

CARBOLOY COMPANY, INC., 11171 E. 8-Mile Road, DETROIT, MICHIGAN

CHICAGO • CLEVELAND • NEWARK • PITTSBURGH • PHILADELPHIA • WORCESTER, MASS.

CARBOLOY

REG. U.S. PAT. OFF.

TUNGSTEN CARBIDE—TANTALUM CARBIDE—TITANIUM CARBIDE

FOR CUTTING, DRAWING, SHAPING, EXTRUDING METALS AND NON-METALLICS

★ FOR REDUCING WEAR ON EQUIPMENT OR PRODUCTS YOU USE OR MAKE ★

Pittsburgh Wires

A COMPLETE LINE FOR ALL FABRICATING NEEDS

STAINLESS STEEL WIRES

COLD HEADING WIRE

SPRING WIRE · CHAIN WIRE

WELDING WIRE · WEAVING WIRE

TINNED WIRE · STAPLING WIRE

POT, SALT AND LEAD ANNEALED WIRE

LINK WIRE · BALE WIRE · CORE WIRE

COPPERED WIRE · FINE WIRE

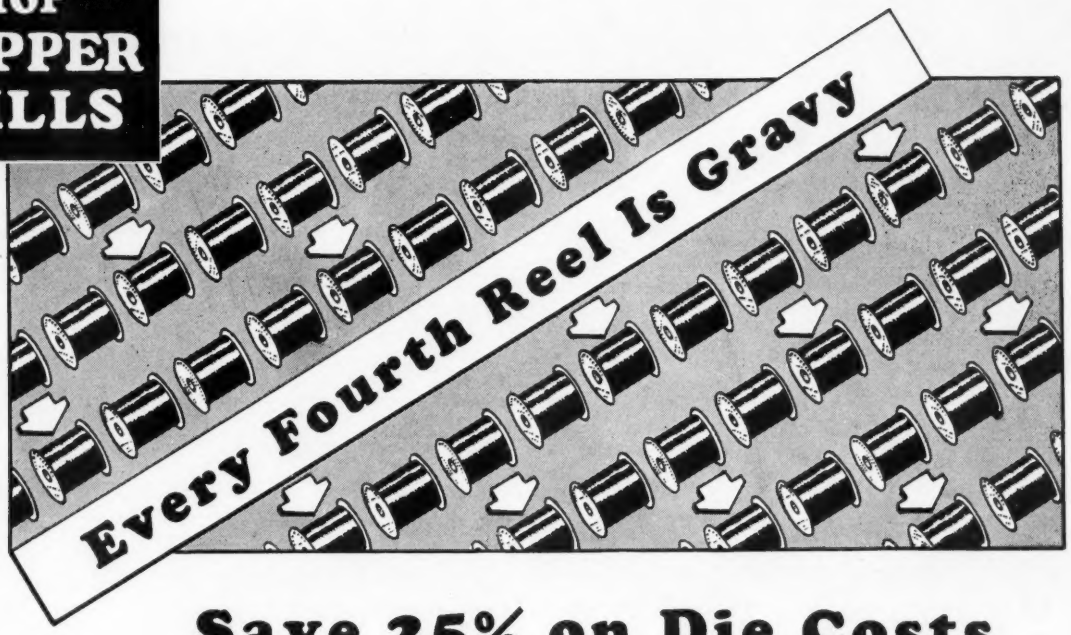
FLAT WIRE · GALVANIZED WIRES

BOX WINDING WIRE

PITTSBURGH STEEL COMPANY

1641 GRANT BUILDING PITTSBURGH, PA.

BIG NEWS for COPPER MILLS



Save 25% on Die Costs

If you draw copper or bronze, you can draw four reels of wire for the cost of three, so far as die costs are concerned.

It's being done every day in those mills which have changed over to Vascoloy-Ramet COP-R-DRAW Dies.*

Can you overlook this opportunity to reduce costs when it is so simple to write, wire or phone a trial order?

*Vascoloy-Ramet Dies make savings on iron and steel wire, too.

Vascoloy

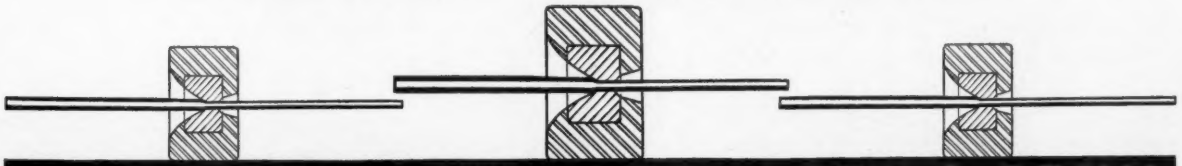
RAMET

TANTALUM-TUNGSTEN CARBIDE DIES

VASCOLOY-RAMET CORPORATION

NORTH CHICAGO, ILLINOIS

Pittsburgh, Pa.; Detroit, Mich.; Hartford, Conn.; Jersey City, N. J.; Cleveland, O.
In Canada: Carbide Tool & Die Company, Ltd., Hamilton, Ont.



COP-R-DRAW TUF-DRAW FER-O-DRAW

Of Course, You're Coming to the

Worcester Regional Meeting of The Wire Association

Worcester, Mass., April 11, 1940

Headquarters and Registration — The Bancroft Hotel — 10:00 A. M.

A Registration Fee of $2.00 will include cost of transportation for plant inspection, dinner at Putnam & Thurston's and an entertainment following the technical session. Parking limitations compel the use of busses for the trip to the American Steel & Wire Company.

12:30 P. M. Officers and Committee Lunch, Bancroft Hotel.

2:00 P. M. Busses leave Bancroft Hotel for South Works, American Steel & Wire Company.

2:30 P. M. Tour of American Steel & Wire Co., including Steel Mills, open hearth furnaces, rolling mills, and inspection of Austempering unit with explanation of its operation.

5:30 P. M. Informal gathering and dinner, Putnam & Thurston's restaurant, Mechanic Street.

7:45 P. M. Welcome by William A. Bennett, Mayor of Worcester.

8:00 P. M. Talk on Tungsten Carbide by J. R. Longwell, Chief Engineer, the Carboloy Company.

9:30 P. M. Floor Show and Entertainment.

Government regulations permit only American Citizens (none representing foreign interests permitted) to visit these plants, consequently reservation cards, showing birthplace and present citizenship, as well as signatures, must be in our hands by April 9th—two days before the meeting—if you desire to make the plant inspection trip.

For those who are interested, a Smith-Stringfellow Reactive Wire Drawing Machine may be seen in operation during the morning, or from 4:30 to 6:00 P. M. Arrangements for this visit must be made through the office of George D. Hartley, 311 Main St., Worcester.

For Reservation Cards Address,

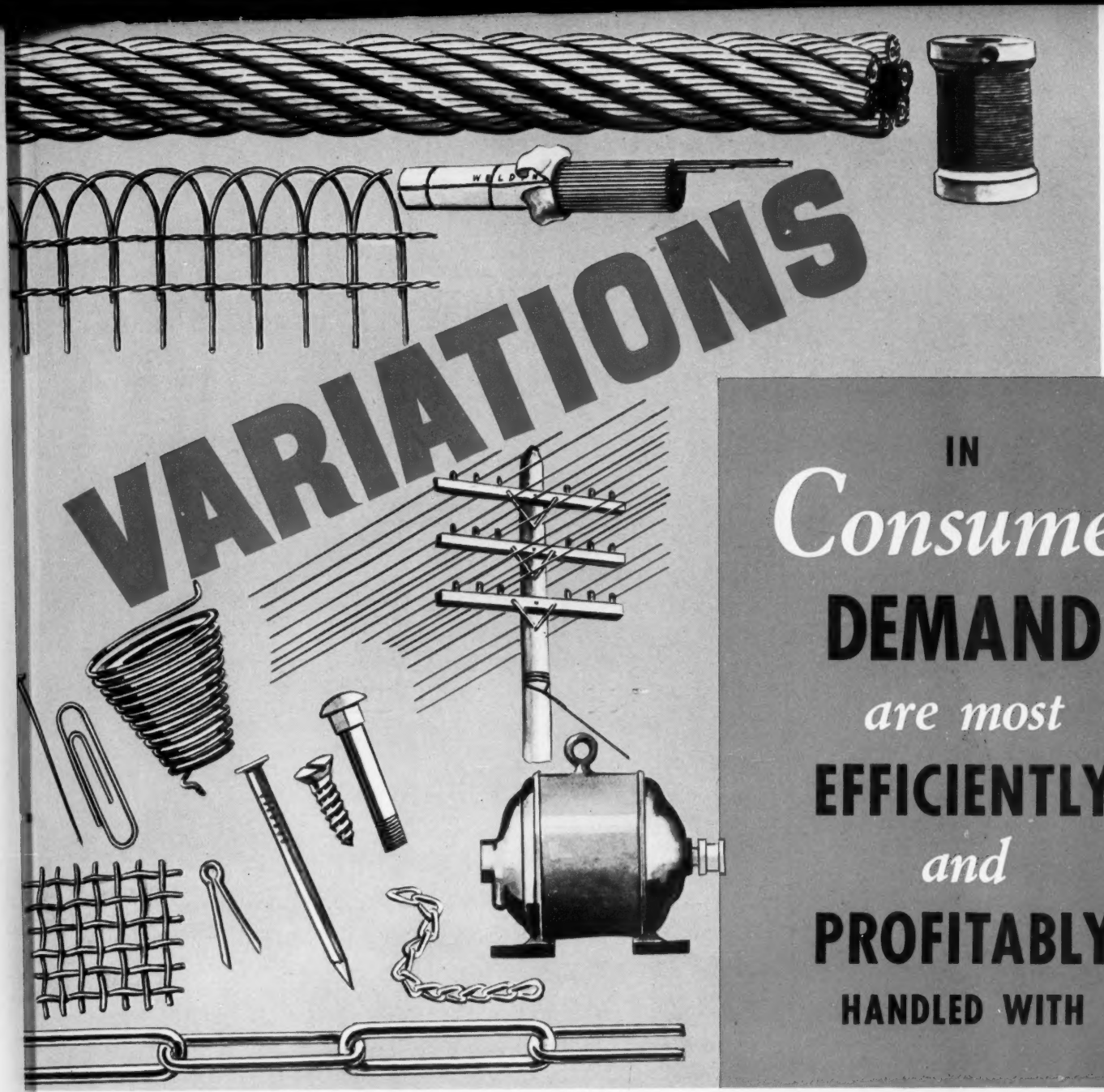
COMMITTEE IN CHARGE

R. R. Tatnall,
Wickwire Spencer Steel Company,
Worcester, Mass.
(CHAIRMAN)

Eugene Roth, Mgr.,
The Carboloy Co.,
Worcester, Mass.

S. Ekstrom, Works Mgr.,
New England High Carbon
Wire Co.,
Millbury, Mass.

E. H. Thomas, Supt.,
Geo. W. Prentiss Co.,
Holyoke, Mass.



IN *Consumer* **DEMAND** *are most* **EFFICIENTLY** *and* **PROFITABLY HANDLED WITH**

VAUGHN

WIRE DRAWING EQUIPMENT

THE differences in wire sizes, wire composition and temper are almost as varied as the uses to which wire is put—reflecting obvious reasons for the wide differences in consumer demand which frequently confront the wire manufacturer.

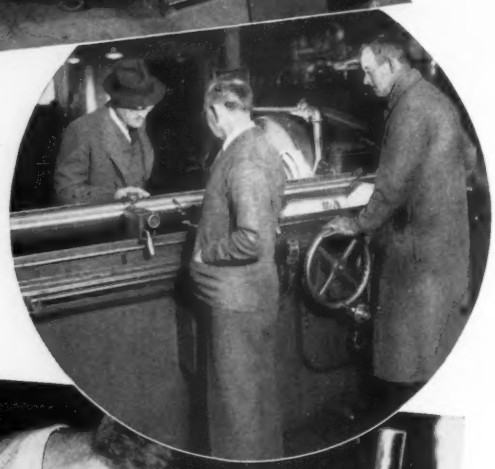
Allied to the problem of variation in character is the question of fluctuation in quantity . . . making doubly fortunate the modern wire makers who enjoy VAUGHN VERSATILITY in production. The lightning speed, ready change of pace and built-in flexibility of Vaughn Motobloc and Motoblox permit nimble adaptation to market demands of the moment—keep your production abreast of your sales—and assure prompt deliveries of uniform-quality products . . . performing with the dependable efficiency and safety which garner *profits* in even the most diversified fields.

Many of the details on Vaughn Machinery are unique; all of them are interesting. Let us show you their practical significance to your own operations!

THE VAUGHN MACHINERY COMPANY

CUYAHOGA FALLS, OHIO

NORTON SERVICE



W-746

A Three Phase Distribution System

(1) In 150 cities Norton distributors carry grinding wheel and abrasive stocks for local needs. (2) Backing them are the Norton warehouses in five industrial centers with a half million stock wheels and facilities for emergency alterations of wheel sizes and shapes. (3) In the Worcester stock rooms are over 2,000,000 wheels in some 100,000 combinations of size, abrasive, bond, grain, grade and structure.

Consulting Engineering Service

Every hamlet is within reach of a representative of a Norton distributor—with experience and knowledge of the industries of the locality. Back of them is the experienced Norton field staff—operating from the Norton offices and warehouses and some twenty other industrial centers. Back of the field men are the special field engineers operating from Worcester—each a specialist in a particular type of grinding.

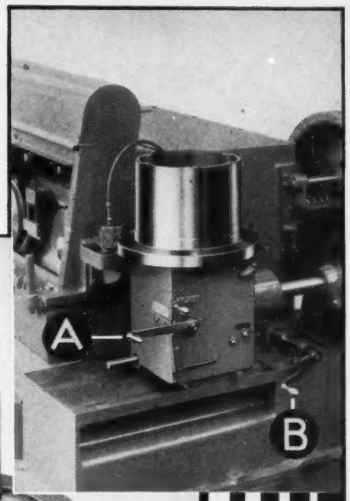
Extensive Research Laboratories

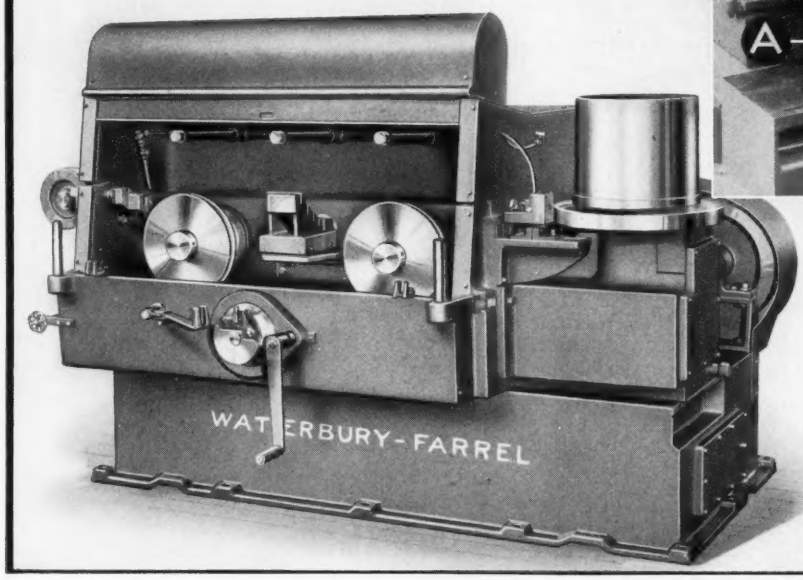
The work of the Norton staff of 50 trained scientists and technicians, with their nineteen well equipped laboratories—50,000 square feet of floor space—is divided into two important phases: (1) the constant improving of abrasives and bonds to provide better grinding wheels; (2) helping the engineering staff in the solving of customers' current problems—working with them in the field and in the laboratories to determine the proper wheels and grinding procedure.

NORTON COMPANY, WORCESTER, MASS.
New York Chicago Detroit Philadelphia Pittsburgh
Hartford Cleveland Hamilton, Ont.

NORTON ABRASIVES

WIRE DRAWING MACHINES





FOUNDED WATERBURY FARREL 1851

by WATERBURY-FARREL

WITH WIRE BLOCKS WHICH *rotate in either direction*

Upright Cone Continuous Machines with provision for quickly changing the rotation and position of block.
Two conveniently located removable handles do the trick in jig time—

A — changes direction of rotation
B — shifts position of block - - -

The machines are available with blocks of various diameters or with spooling devices. Our wire drawing machinery is described in Catalog W.

• WIRE AND ROD MACHINERY • COLD HEADING MACHINERY, ETC. •

WATERBURY FARREL
FOUNDRY & MACHINE COMPANY
WATERBURY • CONNECTICUT • U·S·A

CHICAGO CLEVELAND NEWARK, N. J.

Send for Your Reservation Card

for the

Pittsburgh Regional Meeting

OF THE WIRE ASSOCIATION

which will be held at

Pittsburgh, Pa., Friday, May 17th, 1940

Headquarters and Registration will be at the William Penn Hotel

There will be no registration fee as all expenses are contributed by the Firth-Sterling Steel Company, including transportation for the plant inspection and the dinner at the William Penn Hotel preceding the evening meeting.

— THE PROGRAM —

10:30 A. M. to
1:30 P. M. — Registration at William Penn Hotel.

1:30 P. M. — Busses leave William Penn Hotel for Firth-Sterling Steel Co. plant at McKeesport, Pa.

2:30 P. M. — Tour of Firth-Sterling Steel Co. plant. Motion pictures at plant.

5:00 P. M. — Return to hotel.

6:30 P. M. — Dinner. All registered members and guests of the Wire Association and guests of the Firth-Sterling Steel Co.

8:00 P. M. — Technical Sessions—Informal 15-minute talks on current operating and production problems — Open for full discussion (all off-the-record).

The plant inspection trip is limited to WIRE MILL EXECUTIVES AND OPERATING MEN who are AMERICAN CITIZENS AND WHO DO NOT REPRESENT ANY FOREIGN INTEREST.

✦ ✦ ✦

For the convenience of those who do not make the plant inspection trip Wire Association Headquarters Rooms will be open all day at the William Penn Hotel.

Reservation cards, showing birthplace and present citizenship, must be in our hands not later than May 15th, 1940. These may be obtained by addressing

RICHARD E. BROWN, EXECUTIVE SECRETARY
THE WIRE ASSOCIATION

300 MAIN STREET STAMFORD, CONN.

Subject: The importance of new methods in rod making

Because of its high operating speed, a continuous rod mill requires an extremely flexible method of control to produce rods of accurate section, sound structure and good surface.

Bethlehem fully recognizes this need for flexible control and has introduced new methods to obtain it.

Multiple-motor drive—In older continuous rod mills, all of the stands operated in tandem from a fixed gear train and single-motor drive. Delicate speed adjustments between stands (to compensate for inevitable roll-wear) are impossible with this set-up. The new Bethlehem mill has 8 separate driving motors, the speed of which can be adjusted independently to prevent stretching or overfilling of rods when roll-wear changes gripping power of the rolls.

Looping stands—The two "looping stands" in Bethlehem's new rod mill act as speed compensators. Located at the end of the intermediate roll train, they reverse the direction of the rods twice, in the form of two U-bends or "loops," before feeding the rods into the finishing stands. These "loops" are free to shorten or lengthen. They absorb slight differentials in speed without damaging the rods by stretching or overfilling.

Pressure-film bearings—Rod-mill bearings function at tremendous speed, and, without proper precaution are apt to wear and cause an error in rod-section. Bethlehem's new pressure-film bearings cannot wear because there is no metal-to-metal contact. An oil-film of constant thickness is maintained under pressure between the bearing surfaces. The bearings "float."

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY

WIRE FOR NAILS

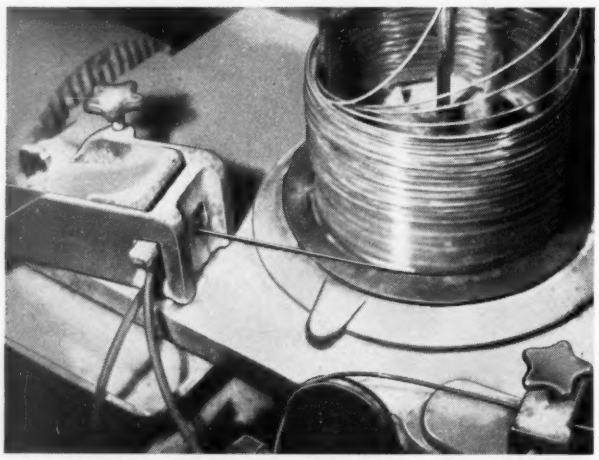
drawn by the mile to sell by the inch

NAILS were "good money" in the 18th Century. For in those days a single nail represented several "man hours" — and millions of people got along without them.

Today the wire nail is one of the principal products of low carbon wire. Drawn by the mile for sale by the inch, its chief requirements are uniformity of size and quality; high speed production at low cost.

Thanks to modern equipment such as Morgan-Connor Continuous Wire Drawing Machines, the wire nail is now an infinitesimal part of a "man hour." But it is still "good money" because millions of people can't get along without them!

● Continuous Wire Drawing Machines; Take-up Frames; Horizontal Bull Blocks; Vertical Spindle Bull Blocks; Reels; Pointers; Wire Mill Accessories.



MORGAN CONSTRUCTION COMPANY
WORCESTER, MASSACHUSETTS, U. S. A.

Sole European Representatives: MALMEDIE & CO., Dusseldorf, Germany

MORGAN
WORCESTER
ENGINEERS AND
MANUFACTURERS

WIRE DRAWING MACHINERY

WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable

DRAWING—ROLLING—EXTRUDING—FORMING—FABRICATING

Vol. 15 APRIL, 1940 No. 4

Designated as

Official Publication By The Wire Association

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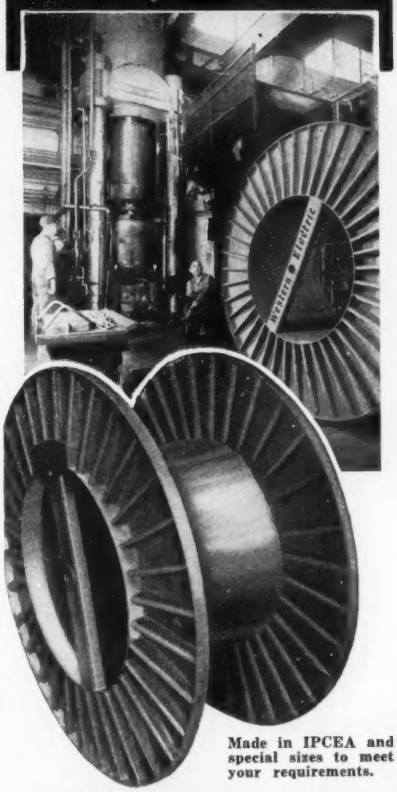
Stevens
LOW-TARE
Shipping Reels
and
FLANGED STEEL DRUMS



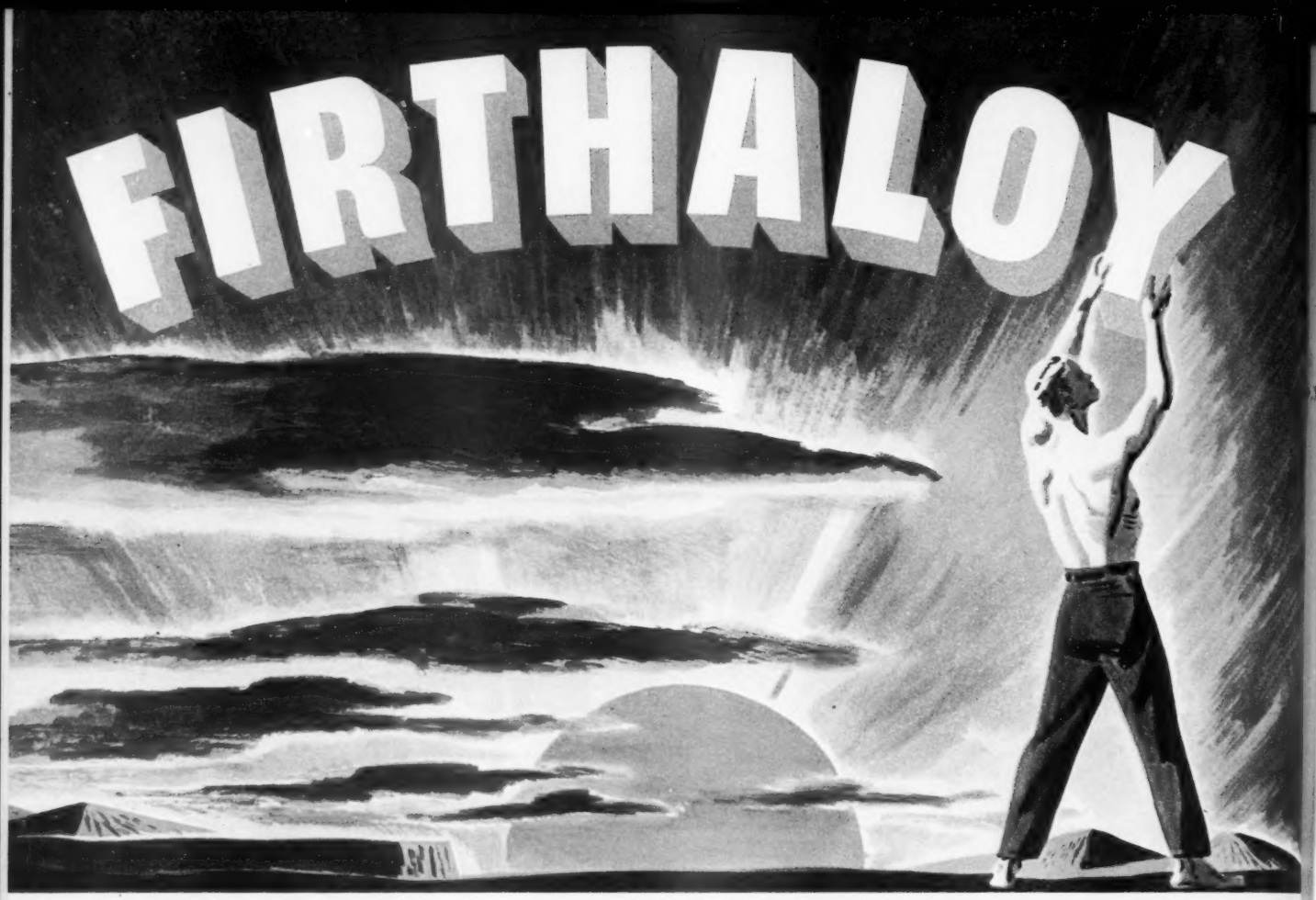
Made in IPCEA and special sizes to meet your requirements.

ALL STEEL Construction
PROVIDES
LOW WEIGHT and
LONG LIFE ECONOMIES

They are built to last—sturdy at the hub, and engineered with shock absorbing characteristics to withstand side stress. Write for interesting data and prices.

Manufactured under license arrangements with Western Electric Company, Incorporated

THE STEVENS METAL PRODUCTS, CO.,
NILES, OHIO



. . . solves new wire problems daily for manufacturers and fabricators

A decade ago just another trade-name—today a BASIC "metal". . . that's FIRTHALOY!

From the first simple but amazingly better Firthaloy round dies, to the heading, forming and shaping dies of today, its supremacy has never been successfully challenged. Not content to rest upon laurels already gained, Firth-Sterling envisions even greater usefulness for Firthaloy in Die applications yet untried.

There may be a lot of gentle hokum in many a current invitation to submit your problems to this supplier, or that, for solution. But Firth-Sterling and Firthaloy have won the right, through practical achievements, to have such a suggestion seriously considered.

So, if you have a difficult die problem to lick, take our word for it, Firthaloy engineers can successfully adapt Firthaloy to your needs nine times out of ten.

FIRTH-STERLING STEEL COMPANY

OFFICE AND WORKS:
McKEESPORT, PA.
BRANCH WAREHOUSES:
NEW YORK CHICAGO
HARTFORD PHILADELPHIA
LOS ANGELES DAYTON
CLEVELAND DETROIT

WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
Wire Products and Insulated Wire and Cable.
DRAWING --- ROLLING --- EXTRUDING --- FORMING --- FABRICATING

Vol. 15 APRIL, 1940 No. 4

Wire Association Elects Officers

Beeson of Pittsburgh Steel Company elected President—Directors consider program for Annual Convention — Regional Meeting arrangements confirmed — Program Committee outlines activities. ✦ ✦ ✦

AT the Annual Meeting of the Board of Directors of the Wire Association, held at the Waldorf-Astoria Hotel, New York, on March 8th, 1940 the following officers were elected for the 1940-41 term:

President—J. K. Beeson, Assistant Manager of Sales, Pittsburgh Steel Company, Pittsburgh, Pa.

Vice President, Ferrous Division — B. L. McCarthy, Chief Metallurgist, Wickwire Spencer Steel Company, Buffalo, New York.

Vice President, Non-Ferrous Division—E. W. Clark, Mechanical Engineer, Wire & Cable Section, General Electric Company, Schenectady, New York.

Executive Secretary—Richard E. Brown, Publisher, "WIRE AND WIRE PRODUCTS", Stamford, Conn.

✦ ✦ ✦

AT this meeting the following Directors, who were elected by a mail vote of the Association for three years from March, 1940, were seated. These Directors were:

John C. Callaghan, Works Manager, Canada Works, Steel Company of Canada, Ltd., Hamilton, Ontario, Canada.

M. A. Kent, Vice President, General Cable Corporation, New York, New York.

B. L. McCarthy, Chief Metallurgist, Wickwire Spencer Steel Company, Buffalo, New York.

F. A. Westphal, Superintendent, Wire Mills, Sheffield Steel Corporation, Kansas City, Missouri.

R. E. Brown, Publisher, WIRE & WIRE PRODUCTS, Stamford, Conn.

THE Directors' Meeting was followed by a Luncheon with about thirty members of the Association present and this was followed by informal discussions regarding the activities of the Association for the coming year.

✦ ✦ ✦

MR. J. K. BEESON

After graduating from Yale University in 1929, Mr. J. K. Beeson joined the Pittsburgh Steel Company, and worked in the Research Department making a thorough study of Wire specialties for a period of five years. In the year 1935 he was made Manager of Manufacturers' Products Sales. One year later he was made Assistant General Superintendent at the mill, and in 1938 became Assistant Manager of Sales. In April 1939 he was appointed Assistant General Manager of Sales which position he now holds.

AT the Directors' Meeting it was brought out that the present membership of the Association was 383, an increase of 38 during the year and plans were laid for a membership campaign to be conducted entirely on an invitation basis during the present year.

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ALTHOUGH it was not definitely decided, it is contemplated that when the membership reaches 500 it will then be "closed" and a waiting list established thereafter.

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1940 Convention

THE Annual Wire Association Technical Meeting and Convention will be held in association with the National Metal Congress at Cleveland, Ohio, October 21-25, inclusive.

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THE Headquarters of the Wire Association will be at the Hotel Carter where the Registration Desk will be established and the Wire Association Headquarter's rooms for informal meetings will be maintained in the same manner as in previous years.

Designated as Official Publication by the Wire Association

THE Program Committee reported that at the present time they had arranged for eleven papers and one moving picture leaving open the opportunity to present not more than five additional papers. This is a much better situation than existed in previous years when the question of the program was not taken up until March, prior to the meeting, and insures the presentation of very excellent and thoroughly prepared papers.

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IT was announced that the speaker for the Wire Association Luncheon would be C. M. White, Vice President of Operations of the Republic Steel Corporation.

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THE Mordica Memorial Lecture will be delivered by B. L. McCarthy, Chief Metallurgist, Wickwire Spencer Steel Company at the Annual Wire Association meeting on Wednesday afternoon of the Convention week, immediately following the Luncheon.

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Regional Meetings

THERE will be two Regional Meetings in 1940. One, The Worcester Regional Meeting at Worcester, Mass., on April 11th and the other at Pittsburgh, Pa., on May 17th.

RODMAN R. TATNALL
Chairman of Committee for Worcester Regional Meeting

Born in New Rochelle, N. Y., in 1906. Educated at Worcester Polytechnic Institute. First employment one year in Development Dept. of Waltham Watch Co. In 1928, joined Wickwire Spencer Steel Co. in spring production dept. In 1930, was promoted to position of Metallurgical Engineer, and since then has been in charge of experiment and research on spring and spring materials. Member of Wire Association and American Society for Metals.

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The Worcester Regional Meeting

THE Program for the Worcester Regional Meeting is as follows:

10:00-12:00 A. M.—1:30-2:00 P. M.—Registration at the Hotel Bancroft.

12:30 P. M.—Luncheon for Officers and Program Committee.

2:00 P. M.—Busses leave Hotel for plant inspection trip through mills of American Steel & Wire Company. Included in the plant inspection will be a demonstration of the Austempering process.

5:30 P. M.—Informal gathering and Dinner at Putnam & Thurston's Restaurant.

8:00 P. M.—Talk on Tungsten Carbide by H. R. Longwell, Chief Engineer, The Carboloy Company.

9:30 P. M.—Floor show and entertainment.

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BECAUSE of Government regulations none but American citizens (and none representing foreign interests) will be allowed to make the plant visitations. It is, therefore, necessary to have the registration cards, which have been sent to members, filled in and returned not later than April 9th in order to be able to participate in this activity.

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THERE will be a registration fee of $2.00 for this meeting which will include the transportation costs, the dinner and the entertainment.

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THE Committee in charge of the Worcester Regional Meeting consists of:

R. R. Tatnall — Chairman — Wickwire Spencer Steel Company, Worcester, Mass.

Eugene Roth, Manager, Carboloy Company, Inc., Worcester, Mass.

S. Ekstrom, Works Manager, New England High Carbon Wire Company, Millsbury, Mass.

E. W. Thomas, Supt., Geo. W. Prentiss & Company, Holyoke, Mass.

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Pittsburgh Regional Meeting

THE Pittsburgh Regional Meeting will be held May 17, the program to be announced by letter to members of the Association and will be in charge of Mr. A. R. Zapp of the Firth-Sterling Steel Company.

(*Please turn to Page 232*)

To Deliver the 1940 Mordica Memorial Lecture

BENJAMIN LEWIS McCARTHY
Vice President, The Wire Association

Born in Lockport, New York, in 1895. In 1913 was employed as Assistant Chemist by Simonds Saw and Steel Co. In 1916 was employed by Wickwire Steel Co., now known as Wickwire Spencer Steel Co., as Assistant Chief Chemist. Three years later was promoted to Chief Chemist and Metallurgist. Now in charge of the Chemical and Metallurgical Laboratories and directs research and special investigation into the Chemistry and Metallurgy of steel, steel wire and wire products. Member of the Wire Association, The American Society for Testing Materials, and the American Society for Metals. Awarded the Wire Association Medal for the most meritorious paper on wire manufacture or fabrication during the years 1935 and 1937.

A. R. ZAPP
Chairman of Committee for Pittsburgh Regional Meeting

Attended Franklin & Marshall College, The United States Naval Engineering School, and Stevens Institute of Technology. Served two years as Engineering Officer in U. S. Navy. Five years in the Research Division of the Allied Chemical and Dye Corp. Four years with the Reily-Stoker Corp. Three years with Union Wire Die Corp. From 1932 with the Firth-Sterling Steel Company as manager of the Firthaloy Division. Member, The Wire Association.

A New Method of Testing Enameled Wire

By Ronald H. Lloyd,
Westinghouse Electric & Manufacturing Co.,
East Pittsburgh, Pa.

A short circuit test for fine wire to replace the well-known mercury test, together with the results obtained and the advantages of the new testing method are discussed. ✦ ✦

Introduction

THE tests which manufacturers of enameled wire make on their product may be divided into two general classes.

(a) **Spot tests on the physical properties of the conductor and the enamel insulation. Some of the properties tested are the hardness and spring of the copper, and the scrape-hardness, abrasion resistance, solvent-varnish resistance, flexibility, and heat resistance of the enamel film.**

(b) **Continuous or spool tests, in which hundreds of feet of enameled wire are passed through a test machine which counts and records insulation defects so as to determine the probable winding performance of the wire.**

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THIS paper is concerned only with tests of the second type. At the present time the well known "Mercury Test" is almost universally used to make spool tests on enameled wire. The wire is passed through a bath of mercury, and as each insulation defect enters the liquid a suitable electrical circuit is completed so as to automatically register on a counter. This is the continuity test specified by the N.E.M.A., which has also established the test voltage to be applied between the mercury and the conductor.

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IT has been generally recognized for a long time that the mercury test is not satisfactory. Recently an attempt was made in our laboratory to correlate the mercury test results with the winding performance of the wire in the field. More than a million feet of enameled wire was tested over a period of about a year, but it was found to be impossible to predict the performance of the wire from the results of the tests. It is now understood that there were two major reasons for this failure to correlate test results with field results, as will be apparent in this paper. In general, the mercury test was inadequate because:

(1) **It failed to take into account a primary factor affecting winding performance, i. e., winding tension. Variations in field results directly due to variation in winding tension simply masked out differences in the quality of enameled wires as measured by the mercury test.**

(2) **Relationship between the mercury test and the short circuit test is of such a nature as to show the former practically useless for most of the enameled wire now commercially produced.**

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RONALD H. LLOYD

Born in Sheffield, England in 1911. Came to United States in 1913. Educated in Pennsylvania Public Schools. Graduated (B. S. in Physics) from Ohio University in 1932. Taught high school from 1932 to 1937. Materials development engineer with Westinghouse Electric and Manufacturing Company from 1937 to present.

The Short Circuit Test

THE new test which was developed to replace the mercury test is shown in Figures 1 and 2. The enameled wire is unwound from the supply spool (A) and passes around the two drums (B) which may be used to stretch the wire if desired, and also acts as a backstop for controlling the winding tension. The test coil (secondary) of the test transformer, shown in the photograph, is wound on a demountable spool (D), while the tension is continuously measured by means of a simple tensiometer (C). Both the stretching drums and the test coil spool are driven by independently controlled direct current shunt motors, so that a wide range of winding tensions is possible.

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A MOTOR generator set impresses voltage at 550 cycles on the primary of the coil test transformer, and the no-load primary losses are read on a wattmeter. The primary e.m.f. usually used is 70 volts, which produces an e.m.f. of one volt per turn in the secondary. Then the drums (B) and the test coil spool (D) are started and the enameled wire is wound onto the spool surrounding the magnetic circuit so that the test coil becomes the secondary of the test transformer. The winding tension, as indicated by the tensiometer, is maintained at the desired value by adjusting the speed of the test coil spool as the coil builds. The apparatus is allowed to run until a short circuit in the wound secondary is indicated by a sudden in-

crease in the primary wattmeter reading. A record of the length of wire used up to the time of shorting is kept by means of a clock escapement driven by the stretching drums.

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FIGURE 3 shows the results of calibration tests on the coil test transformer obtained for three sizes of enameled wire by short-circuiting the specified number of turns in the secondary coil.

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Test Results

FROM the beginning, tests with this new equipment indicated the importance of winding tension in the performance of the enameled wire. This fact will be apparent in all the curves shown on these pages. Over a period of two years, during which several hundred spools of fine wire totaling more than three million feet were tested, not a single instance was found wherein a reduction in winding tension was not accompanied by an increase in the average coil length of wire wound prior to short circuit. Sometimes as much as a five fold increase in coil length resulted, from a sixty per cent reduction in tension from an arbitrary maximum value (equivalent to 75% of the ultimate tensile strength).

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AS the work proceeded, it was noticed that with remarkable regularity the short circuit was located in the underlayers of the coils; only in very rare instances were the top layers of the coil directly involved. Post-mortems on the shorted coils were made by running the equipment in reverse and noting the point at which the short cleared from the coil. In general, about 25 per cent of the shorts occurred in the first few layers of the coil, and approximately 75 per cent occurred within the first third of the layers. Practically no shorts were found between turns; in nearly every case the short had occurred between layers.

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FROM the position of the short circuit in the coils, and the great effect of the winding tension, it seemed obvious to conclude that the shorts are primarily due to pressure. However, tests made by loading weights on enameled wires crossed at right angles on a smooth steel surface showed that relatively enormous pressures are required to cause shorting. Therefore, it was evident that the pressures built up in the coil are not the fundamental cause of the trouble.

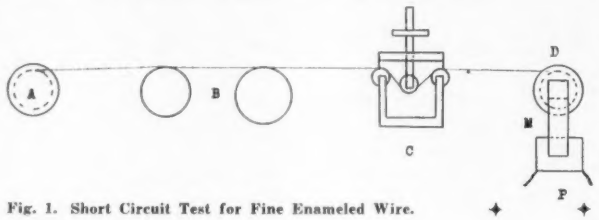

Fig. 1. Short Circuit Test for Fine Enameled Wire.

A. Supply spool of enameled wire being tested.
B. Driving drums, used to control tension and stretch the wire if required.
C. Tensiometer, to measure winding tension.
D. Test spool, on which the test coil is wound.
M. Magnetic circuit.
P. Primary coil of test transformer.

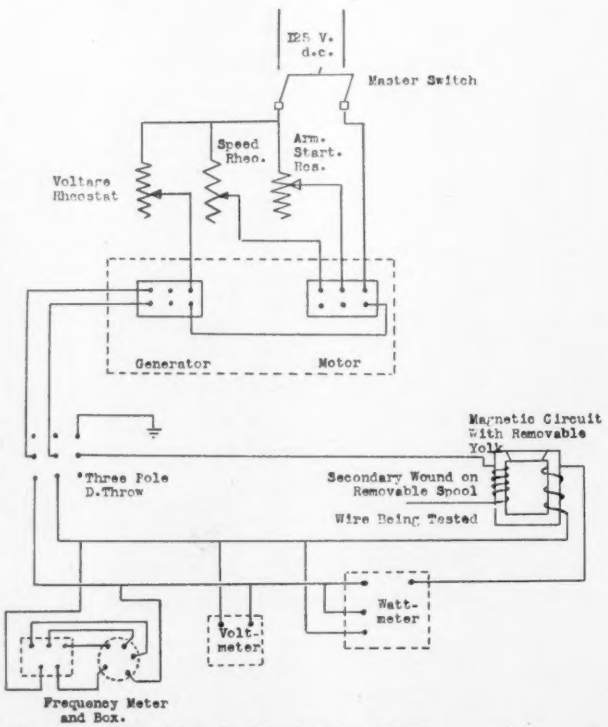

Fig. 2. Short Circuit Winding Test for Enamel Wire.

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SUBSEQUENT work has established beyond reasonable doubt that the short circuits are caused almost entirely by minute splines, slivers and copper dust which are known to be present on the conductor surface. Because of the pressure the copper slivers and dust are pushed through the protecting insulation to make contact with an adjacent conductor.

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Special Copper Wire

BECAUSE of the apparent importance of the copper surface in enameled wire, it was reasoned that wire drawn from specially prepared copper rod should give much better results when insulated than wire drawn from ordinary hot rolled rod. Figure 4 shows this to be true. Enameled at the same time, on the same machine, and under similar conditions, the worst sample of special wire was a 100 per cent improvement over the best hot rolled sample. Also it will be seen that the relative improvement in performance from high to low winding tensions is greater for the special wire. This would be expected of the wire which has the smaller slivers on its surface. In other words, it seems reasonable to conclude from the relative position of the two curves that the special wire has the fewest slivers; and from the slopes of the curves to conclude that the special wire has the smallest slivers. This was expected of the specifically prepared wire from physical considerations. All of the points of the curves represent

the means of approximately ten tests.

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Effect of Film Thickness

AS might be expected when the fundamental cause of shorted coils is poor conductor surface, the enamel film thickness covering the wire was found to be a highly important factor in the quality of the finished enameled wire. Figure 5 shows the results obtained by short circuit tests on both extruded and standard copper wire. Spools of standard wire and specially prepared relatively sliver free wire were first divided into four spools of shorter length and then the resulting four sections of the original wire were enameled with 2, 3, 4, and 6 coats respectively. All the conditions of manufacture were the same for the two types of wire; in fact the standard wire and the special wire were enameled on the same enameling tower at the same time.

IN making short circuit tests on the wire the same winding tension (1.7 pounds) was used throughout, and the primary voltage was adjusted so that the ratio of inter-turn test voltage in the secondary to the enamel film thickness was equal to three volts per turn per mil of enamel thickness. It is interesting to note that for the thinner films the benefit of the special wire becomes progressively less as the enamel thickness is reduced. Both curves intercept the horizontal axis at about .16 mils (film thickness), which would seem to indicate that on both types of copper wire there are an enormous number of slivers about .00015 inches in length. Above .0015 inches the distribution of sliver length is probably normal since the straight lines show that the effectiveness with which they are covered depends solely on the enamel thickness. Since both the special and standard wire show similar skewness in the distribution of sliver length in the region below .00015 inches, it would seem that some manufacturing procedure common to both is responsible for these shorter slivers. Perhaps the shorter slivers are due to the action of the drawing dies which is the same for both types of wire; whereas the longer slivers are the result of rod mill practice, which would explain the better quality of the special wire.

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FIGURE 4 also shows the effect of enamel thickness on the performance of enameled wire. The lower curve represents an average spool of regular enameled wire, and the upper curve represents an average spool of heavy enameled wire in which the enamel thickness is about 40 per cent greater. The results shown correlate very highly with the performance of the two types of enameled wire in practice.

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A GREAT improvement in the quality of the enameled wire has recently been obtained due to

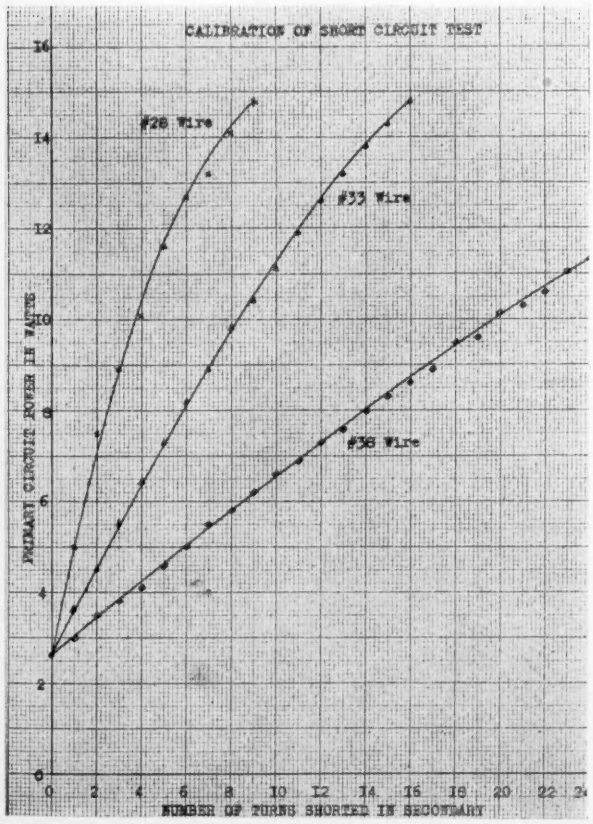

Fig. 3. Calibration of Short Circuit Test. ✦ ✦ ✦

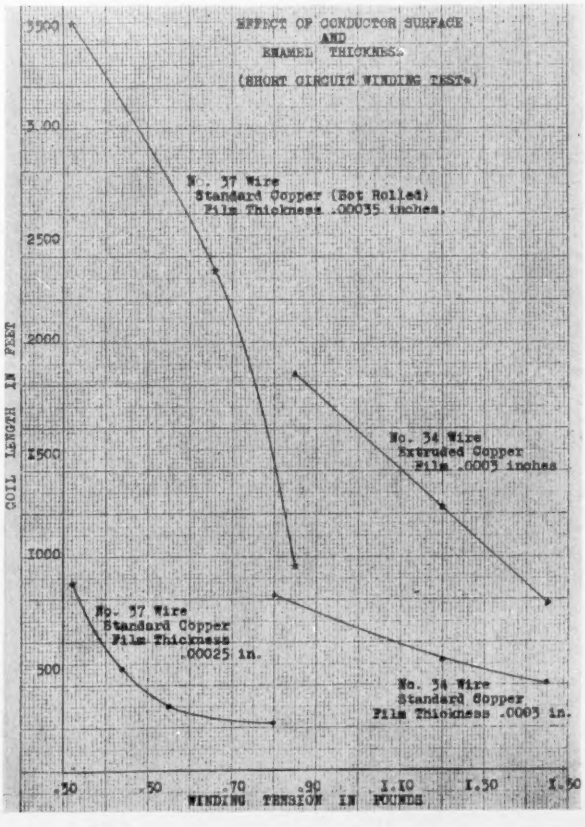

Fig. 4. Effect of Conductor Surface and Enamel Thickness. ✦

recognition of the importance of enamel thickness. It was found that with an improved method of control of the thinner additions to the liquid enamel, the baked enamel thickness could be maintained uniformly throughout the spool, thus eliminating the necessity for the relatively large variations or tolerances previously demanded by manufacturing considerations. Figure 6 shows the improvement which resulted, and also shows the results of tests made on representative samples of enameled wire made by several other manufacturers.

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Film Hardness

AT the present time a great amount of work is being done to replace the conventional modified oil-natural-resin type enamels with synthetic enamels. These synthetic enamels result in tougher, harder coatings which have a great deal more solvent resistance than the present enamel films. With such harder coatings on the copper wire it might reasonably be supposed that the copper slivers would be less likely to penetrate the film of insulation so that better performance during coil winding would result. Such, however, does not seem to be the case.

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FIGURE 7 represents the results of a number of tests made on the conventional type of enameled wire and on two synthetic enameled wires. Synthetic A is an enamel developed as a result of work done in our laboratory and was applied in our own plant; while Synthetic B is a well known synthetic now in production by another manufacturer. Both of these synthetic enameled wires had a scrape-hardness of approximately three times that of the conventional enameled wire, yet it will be seen from the figure that no better results were obtained.

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THIS situation is not entirely understood at the present time, but it would seem probable that the copper slivers are so hard (and sharp) compared to the small relative changes that can be made in the hardness of the insulation, that no noticeable improvement results. Here, evidently, is an instance where it is no idle statement to say that the insulation depends not on the quality but on the quantity of it.

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Effect of Inter-turn Voltage

FIGURE 8 shows a typical test in which the test voltage in the wound coil is varied while the winding tension is kept constant. The curve as plotted shows the

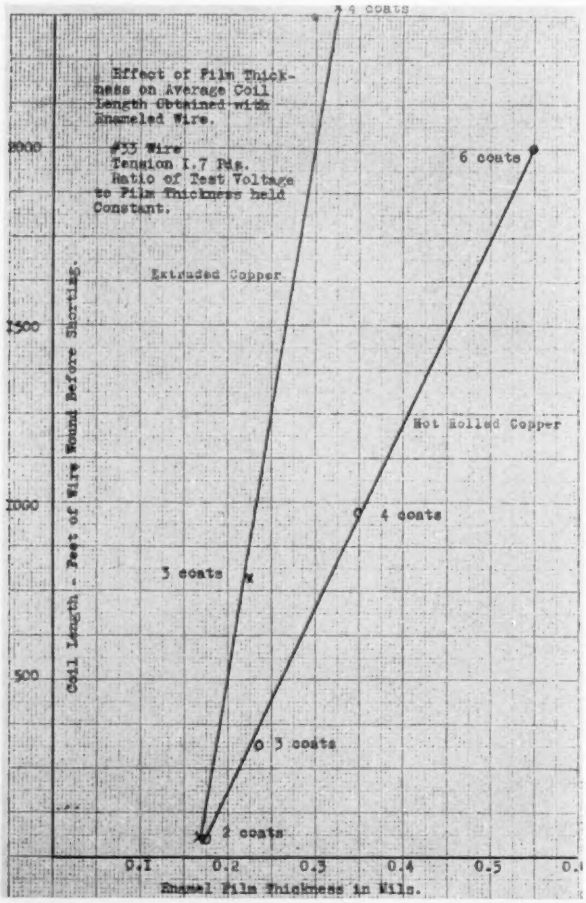

Fig. 5. Effect of Film Thickness on Average Coil Length Obtained with Enameled Wire. ✦ ✦ ✦ ✦ ✦

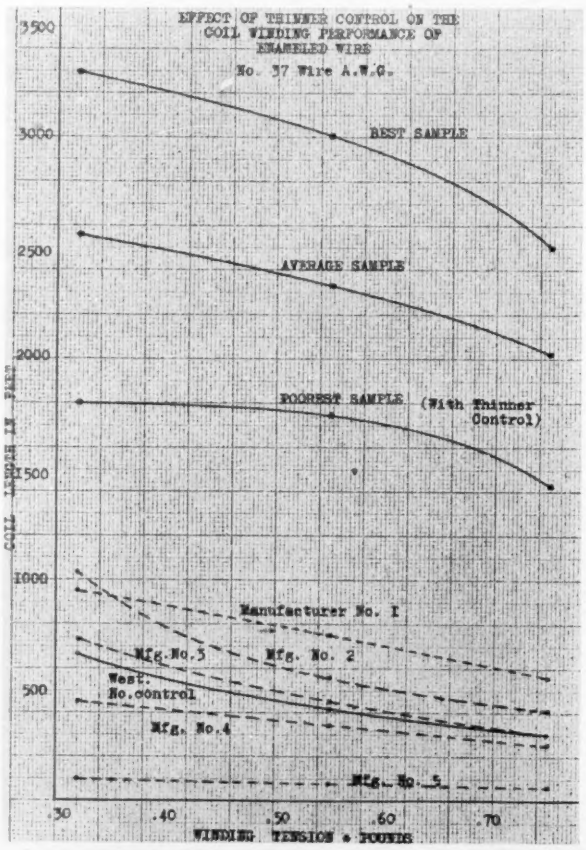

Fig. 6. Effect of Thinner Control on the Coil Winding Performance of Enameled Wire. ✦ ✦ ✦ ✦ ✦

relationship between coil-length and inter-turn voltage, which may be misleading. It must be remembered that practically all of the short circuits occur between layers not between turns. Now with the dimensions of the winding space used, and the size of the wire considered, approximately 50 turns per layer were obtained. Therefore, the actual difference in voltage between the two shorted wires could be anything from the value shown on the curve to 100 times that value, depending upon just where the short occurred between the two layers. In other words the great difference in the results shown for 1 volt per turn and 2 volts per turn might be explained by the fact that the maximum possible interlayer voltage in the two cases is respectively 100 volts and 200 volts. However, careful observation failed to reveal any tendency for the shorts to occur at the edges of the coils in either case; the short circuits seemed to be scattered at random across the width of the coil.

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Hard vs. Soft Wire

FIGURE 9 shows the results of tests made to determine the relative quality of hard drawn and soft drawn copper in enameled wire. Both the hard and soft wire were enameled under the same conditions and to the same film thickness; and after enameling both were equally soft due to the annealing action of the baking tower.

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IT will be seen that there is no significant difference in the results obtained with the two types of wire, unless it be the difference in the shape of the curves. Everyone of the soft wire curves has a downward curvature, while each of the hard wire curves except one has an upward curvature. In effect this means that the hard drawn wire is affected more than the soft wire by a decrease in the winding tension, which may indicate that the hard copper has either more slivers or longer slivers on its surface.

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THIS situation was examined, as shown in Figure 9, by coating the same copper wire (samples S2 and H2) with two different thicknesses of enamel. It will be noticed that with the heavier coating the curvature of the hard wire curve has reversed itself, but is now inferior to the soft wire at all tensions. This experiment was repeated several times with the same result each time. Therefore it seems probable that the hard wire has a great many more slivers on its surface than the soft wire, but that they are shorter than those on the latter.

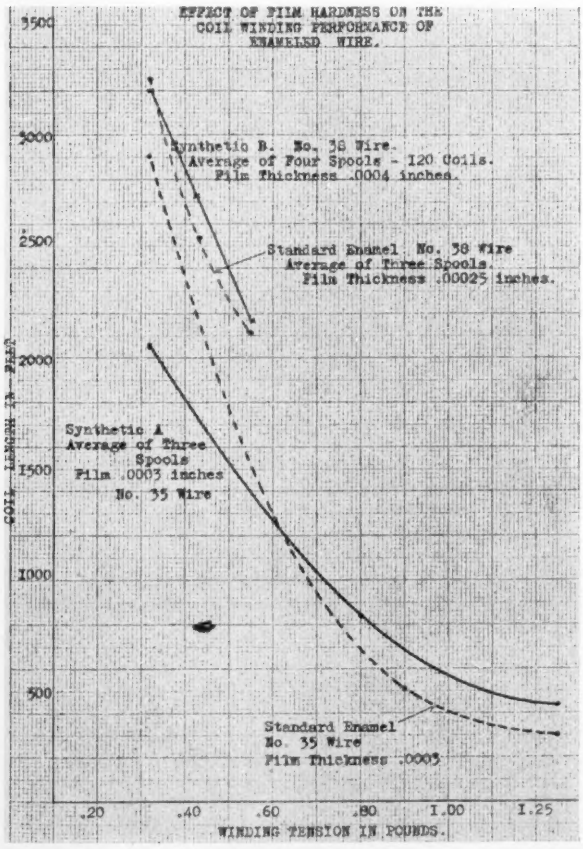

Fig. 7. Effect of Film Hardness on the Coil Winding Performance of Enameled Wire. ✦ ✦ ✦ ✦ ✦

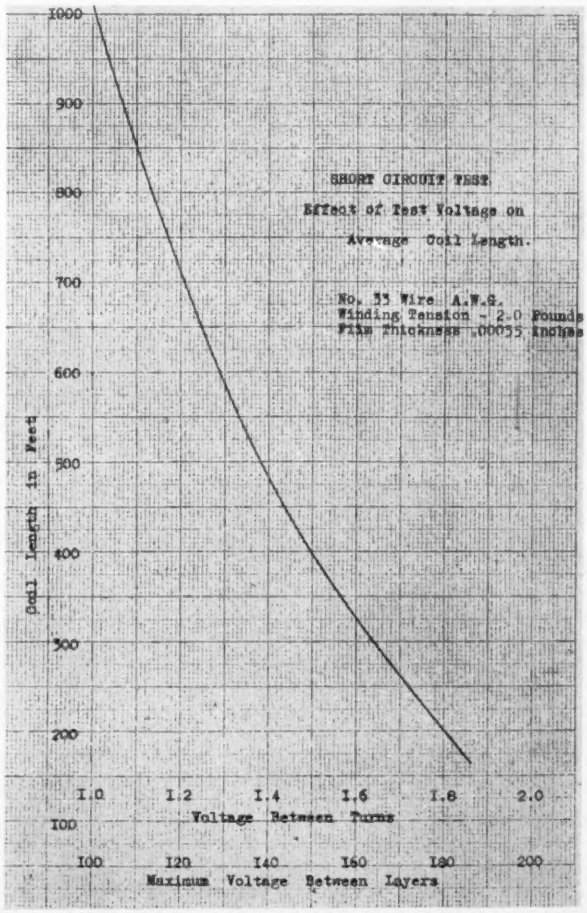

Fig. 8. Short Circuit Test. ✦ ✦ ✦ ✦

Relationship Between Short Circuit Test and Mercury Test

THE relation between the short circuit test and three modifications of the conventional mercury test are shown in Figure 10. The data was obtained by testing four specially selected spools of enameled wire on the two types of test. Each of the sets of three vertical points represents one spool of wire. The characteristics of the three modifications of the conventional mercury test are as follows:

No. 1 Test—Counts the number of spots in the enamel with low insulation resistance (less than 20 megohms) by means of a grid controlled electronic tube trigger circuit.

No. 2 Test—Counts the number of dielectric breakdowns between the conductor and the mercury bath at 250 volts.

No. 3 Test—Same as No. 2, except the wire has been stretched 10 per cent.

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THE No. 2 test, therefore, is the same as the N.E.M.A. test except that the applied voltage is about five times as high. The higher voltage was necessary because otherwise the test was too insensitive. However, still higher voltages cannot be used since for this size wire 250 volts represents a dielectric stress of 750 volts per mil of insulation, and it was found that at higher stress the normal enamel film begins to break down.

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TESTED with the conventional mercury test each of these spools of enameled wire would have been passed with the exception of the poorest one. Yet it will be seen in Figure 10 that the best sample shows a seven fold superiority in coil winding performance over the one which is next to poorest. The situation is made even worse when it is realized that the poorest sample could by no means be considered a commercial product; it was obviously defective. It was impossible to find a sample poor enough, so one was deliberately chosen which had been reheated after spooling with the result that the strands stuck together and caused innumerable bare spots in the enamel when unspooled.

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BECAUSE of the above results it was understood why no correlation had been found between the conventional low voltage mercury test and the coil winding performance of enameled wire in the field.

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Errors and Limitations of Test

IT must be remembered, of course, that in any spool tests of this nature on enameled wire, we are faced with what is primarily a statistical problem, and the results should be so interpreted. Tests made by winding a few coils, and sometimes even tests on whole spools, mean little or nothing.

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AFTER a great deal of preliminary work with the short circuit test, in which all the known causes of variation were gradually eliminated, it was found that the best procedure involved winding about 10 coils each at maximum, average, and minimum tension for each spool of wire. Calculations on the basis of the normal law of errors showed that the probable error of the arithmetical mean (of the lengths of wire wound at a given tension) for a series of 10 coils was usually about 20 per cent of the value of the mean. In other words, if the mean value of a series of 10 measurements is 100 feet the probable error is roughly 20 feet plus or minus. This is satisfactory, but these dispersion errors must not be overlooked when conclusions are drawn from the data. If the difference between the results on two spools of wire is not greater than the combined probable errors of their means, no conclusion as to their quality is justified.

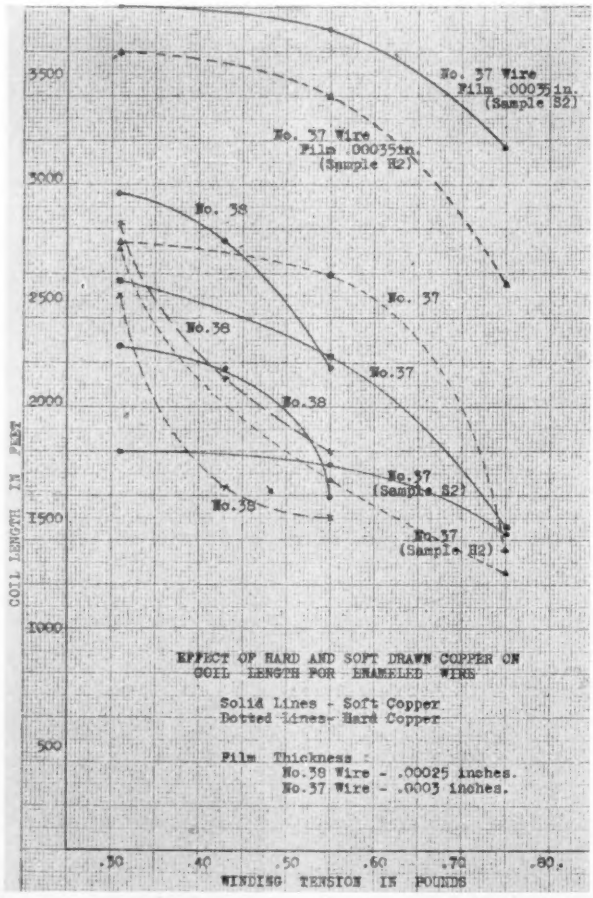

Fig. 9. Effect of Hard and Soft Drawn Copper on Coil Length for Enameled Wire.

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Conclusions

OVER a period of two years it has been established that the Short Circuit Test correlates very highly with the field results in the winding departments.

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ALSO, it has been found that this test offers a much more powerful means than the mercury test for investigating the

separate variables contributing to the over-all performance of the finished enameled wire.

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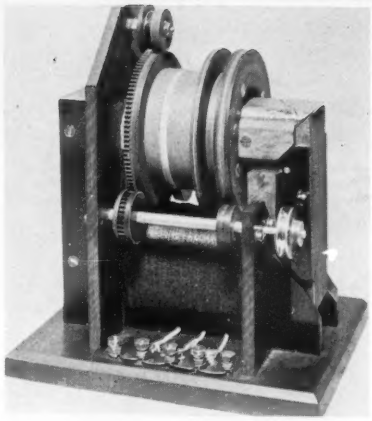
IT has been shown that:

(1) **The amount of enameled wire which can be coiled prior to short circuit varies inversely with the winding tension.**

(2) **The surface condition of the copper is the most important factor in enameled wire quality.**

(3) **The coil length of wire which can be successfully wound varies directly with the enamel film thickness.**



(4) **No better results are obtained with harder, tougher films of synthetic enamel than with standard enamel of the same thickness.**

(5) **It is found that soft drawn copper wire and hard drawn wire, annealed during enameling, give equal results when enameled under the same conditions.**

(6) **Better control of enamel thickness during production has resulted in a great improvement in standard enameled wire.**

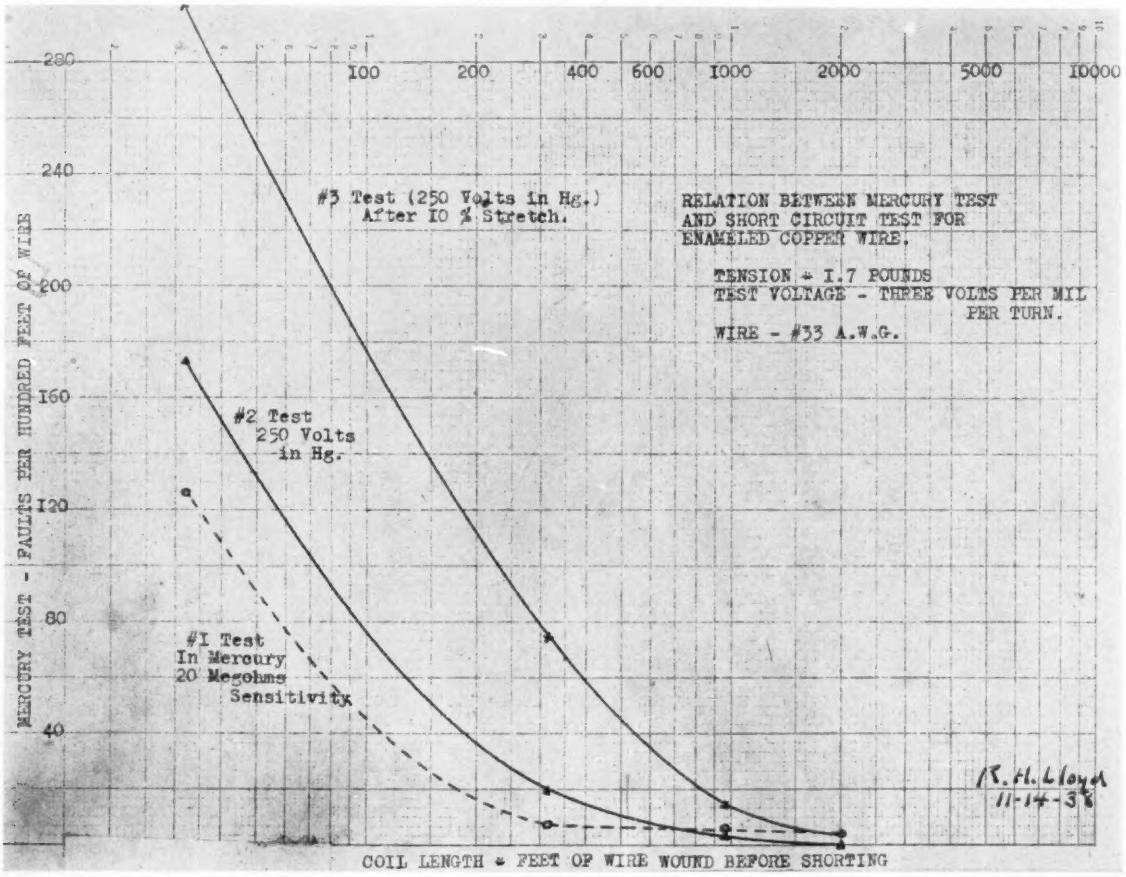


Fig. 10. Relation Between Mercury Test and Short Circuit Test for Enameled Copper Wire. ✦ ✦ ✦ ✦ ✦ ✦

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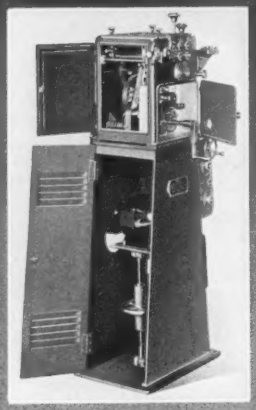

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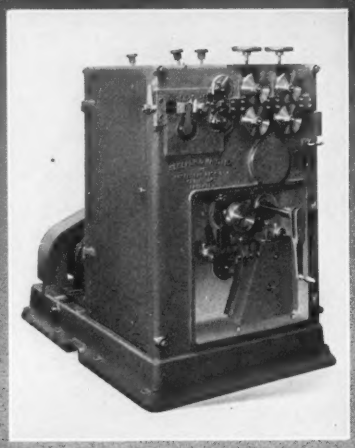
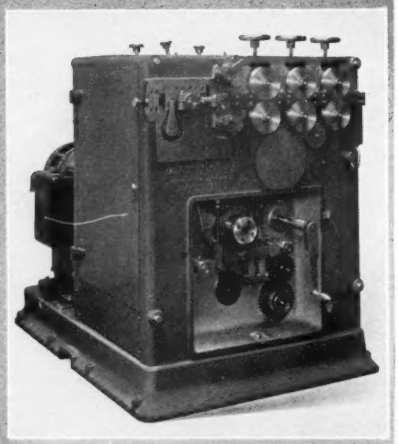


No. 2 Series 667
64" Model

"UNIVERSAL"
SPRING COILERS *(Patented)*

DISTINCTIVE FEATURES

- ✓ Pitch and Diameter Cams and Compound levers are located in recess of front housing.
- ✓ Increased production.
- ✓ Auxiliary Gearing to increase wire length per spring.
- ✓ Quality production.
- ✓ Longer Wire Feed.
- ✓ Heavier Wire Range.
- ✓ Alloy Steel Tools.
- ✓ Anti Friction Bearings.
- ✓ Simplicity of Adjustment.
- ✓ Speed consistent with Accuracy.
- ✓ Heavier and more rugged construction.
- ✓ Morse Recoil Clutch.
- ✓ Morse Free Wheeling Feed Clutch.
- ✓ Tools interchangeable with older models.
- ✓ Pitch and Diameter Cams may be shaped and timed on the Cam Hub, for special springs, and the entire unit removed.
- ✓ One-piece cams can be used on this removable cam hub if desired.



No. 2½ Series 669
72" Model

SLEEPER & HARTLEY, Inc.

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WORCESTER, MASSACHUSETTS, U. S. A.

Theory and Practice of Modern Taping and Stranding

By Otto F. Jagielski,
Consulting Engineer,
Lynn, Massachusetts

PART II — Taping (Continued)

This paper is presented to those interested in Wire Mill machinery as a discussion of the major design features that are necessary in the manufacture of a better product.

Taping (Continued)

Feature "C"

A self-adjusting angle of application, so that if the speed of the cable advance is changed during the operation the angle of application will change automatically.

THE point and angle of tape application must change with the following three conditions:

1. **A sudden change of cable advance known as "backwash".**
2. **Normal change of cable advance.**
3. **Change of taping head speed.**

✦ ✦ ✦

IF the last guide roll is so arranged that the tape cannot follow this change automatically, the tape pulls edgewise, and when subsequent strain becomes too great, the tape breaks.

✦ ✦ ✦

THIS, also, can be mathematically illustrated. See Fig. 3.

✦ ✦ ✦

Figure 3

TO illustrate this feature we will consider the previous example:

We have:

1st. layer: d = 1", W = .750", c = O, α — 76.2°, and a = .7723".

POINT "O" is fixed and assume that h = 4" — γ must be 90° in order to eliminate the edgewise pull of the tape.

$\beta = 180° - (90° + \alpha) - 180° - 166.2° = 13.8°$

$b = h \times \cot \alpha - 4 \times \cot 76.2° = .9825"$

✦ ✦ ✦

THESE are the conditions under which the first layer of tape is applied in the previous example.

✦ ✦ ✦

NOW, for example, if the operator should want to change "c" from a closed but, c = O, to a lap — c = .125", he would slow down the cable advance or increase the taping head speed.

✦ ✦ ✦

WE want to know to what extent the last guide roll must be re-adjusted in order to maintain even tension throughout the width of tape.

✦ ✦ ✦

IT must be mentioned here, that when a tape is applied with a lap, the part of the tape which overlaps is strained more than the part which is applied on the smaller diameter. However, we will not consider this condition in our example and assume that the diameter over which the tape is applied is uniform when calculating the new position of the tape and the last guide roll.

✦ ✦ ✦

WE have: h = 4", W = .750", — c = .125", d = 1".

Formula 1:

$$\cos \alpha = \frac{W - c}{x\, d}$$

$$\text{Cos } \alpha = \frac{.750 - .125}{3.1416 \times 1} = \frac{}{.19894}$$

$\alpha = 78° 32'$

Formula 2:

$$a = \frac{W - c}{\sin \alpha} = \frac{.750 - .125}{\sin 78° 32'} = .637"$$

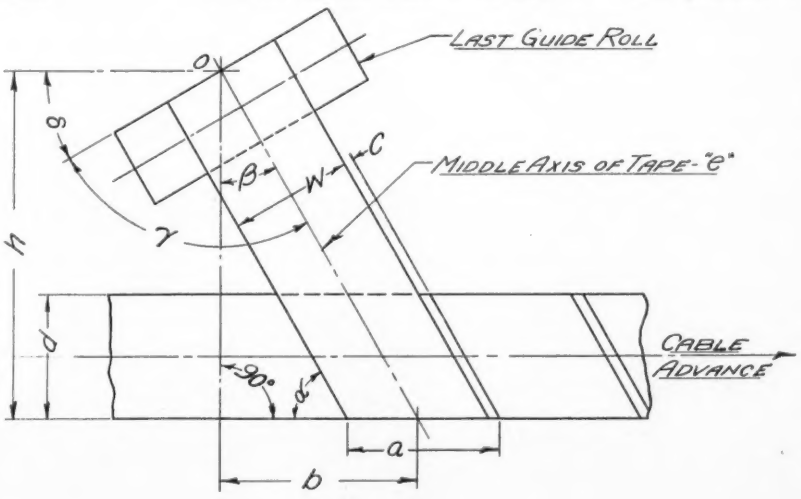


FIGURE 3

$$b = h \times \cot \alpha = 4 \times .20285 = .8114''$$

$$\beta = \delta = 180° - (90° + \alpha) = 180° - (168° 32') = 11° 28'$$

✦ ✦ ✦

ANGLE δ must now be reset to 11° 28′ in comparison with 13° 48′ in previous case, also, "b" has been shortened from .9825″ to .8114″.

✦ ✦ ✦

WITH the above in mind, the loss of time in resetting the rolls by hand on a machine with many tapes speaks for itself.

✦ ✦ ✦

Conclusion of This Analysis

The angle of application on a modern taping machine should be self adjusting.

✦ ✦ ✦

Feature "D"

As near to uniform tension as possible, a tension which can be set properly when the machine is not in motion and which will not change appreciably during the operation.

✦ ✦ ✦

THE manner of obtaining a uniform tension in the tape is a subject of wide discussion. Much attention is being given to the perfection of this feature along many different lines and I am convinced that anyone who has made a thorough study of "tension" will agree with me when I say that an **Absolute uniform tension on a rotating taping head is impossible,** whether controlled electrically or mechanically. There is only one way to maintain an absolute uniform tension in the tape from large to small tape pad diameter, and that is when the tape from a stationary pad is applied to a rotating cable. (Though this is a very slow process as far as tape application is concerned, this is sometimes done for drying and partially saturating the cable.)

✦ ✦ ✦

AS to how close to uniform tension can be obtained and maintained during run-out from large pad diameter to core diameter on a rotating taping head depends largely on the position of the pad, on the design of taping head and the corresponding tension device. Each different position of the tape pad may require a different tension device which will be least affected by centrifugal force or by abrupt starting or stopping of the machine.

✦ ✦ ✦

THE following figures show the most commonly used tape pad positions on taping heads.

Fig. 4, 5, 6, 7, and 8.

Figure 4—Tape pads eccentrically located on head frame, 90° with center of cable. Pad remains in same position when adjusting angle of tape application.

Advantages: This arrangement permits a compact machine with many tapes and high speed.

Disadvantages: When the machine is started or stopped quickly, the pad over-runs or the tape breaks depending on the direction which the tape pulls off the pad. However, this fault can be largely overcome by a suitable tension device.

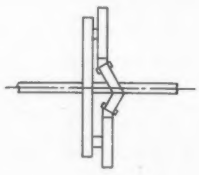


Fig. 4

✦ ✦ ✦

Figure 5—Tape pads eccentrically located on head frame with angle of application adjustable by tilting pad to required position.

Advantages: Simplicity — can be built at low cost.

Disadvantages: Angle of application difficult to adjust — requires more space than arrangement in Fig. 7, — high speed not permissable.

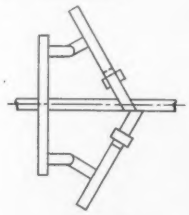


Fig. 5

✦ ✦ ✦

Figure 6—Tape pads eccentrically located on head frame parallel to center of cable.

Advantages: Head can be made for four or eight large pads, allowing a long, uniform run of the machine — Simplicity of design.

Disadvantages: Requires much space, making a machine with many tapes excessively long — permissable speed is comparatively low.

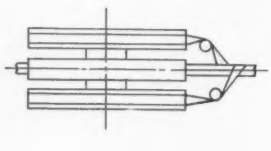


Fig. 6

✦ ✦ ✦

Figure 7 — Tape pads eccentrically located on head frame in a radial position.

Advantages: Simplicity.

Disadvantages: Fan effect and, therefore, power consumption greater than on others — requires much space — not suitable for high speed.

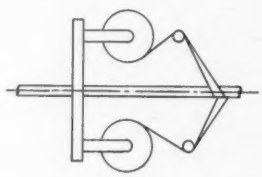


Fig. 7

✦ ✦ ✦

Figure 8 — Concentric type taping head with the cable passing through the core of the pad.

Advantages: High speed permissable with

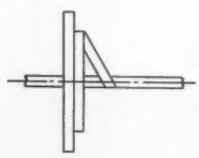


Fig. 8

large pads — new developments permit the use of wide tape with an angle of application as low as 15°, — head unit comparatively short.

Disadvantages: One tape only can be applied with one head, — Storage space for pads necessary which makes a machine with many tapes excessively long.

✦ ✦ ✦

THERE is a concentric type taping head developed in which two tapes can be applied simultaneously with the storage stand eliminated. This head, however, is especially adaptable to steel tape application or other tape applications in which two tapes only must be applied at high speed and both in one direction.

✦ ✦ ✦

NOW, as to the accuracy of the tension on the above illustrated taping heads; this largely depends on

1. **The design of tension device.**
2. **The manner in which the tension device is mounted to produce a tension in the tape relative to a rotating ECCENTRIC or CONCENTRIC type taping head.**
3. **The speed of the taping head.**

✦ ✦ ✦

AS stated before, a uniform tension in the tape on a rotating taping head is not possible. The variation of tension in the tape from large pad diameter to core diameter can be calculated with a fair amount of accuracy if the above three factors are established and the type of taping head known. As such calculations are quite involved, I will refrain from giving an example at this point and treat this as a separate subject of a future article.

✦ ✦ ✦

AT this time I would like to state the results I found with an experimental taping head.

✦ ✦ ✦

IT was a concentric type taping head, designed for pads up to 24″ in diameter and 4″ wide with a maximum angle of application, 15°. The tension device for this large and fast (500 R.P.M. Max.) rotating head was developed and mounted to the head frame accordingly, that is, so that centrifugal forces could least affect same.

✦ ✦ ✦

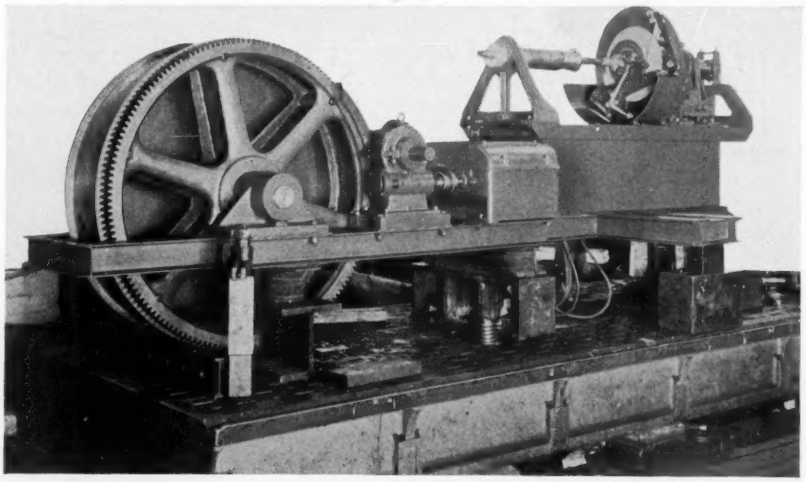
THE theoretical variation of tension established was 2.8%, that is, 2% when the head was not in motion and the tape was pulled off the pad by hand from large pad diameter to core diameter. Two per cent representing the pull required to move the tension mechanism for the automatic release of tension. The calculated pull required to overcome the centrifugal force of moving parts from one position to another to release tension was .8%.

✦ ✦ ✦

THE test on the existing experimental head showed a variation of tension of 1.8% when the tape was pulled from the stationary head. The variation of tension when the head is in motion cannot be measured. However, my conclusion, based on calculations and experimental work, is, that the tension can be brought as close to uniform as 97.4% depending on the type of head and the accuracy of the tension device.

✦ ✦ ✦

IN other words: if a tension of 20 pounds is adjusted when the pad is large, the tension will increase to 20.52 pounds when the pad has run out to core diameter.



The design and construction of this above shown Concentric Type Taping Machine was based on the results of the above stated experimental work and is in successful operation. ✦ ✦

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New American Standard for Magnet Wire To Eliminate Variety in Specifications

By H. D. Crowe,
General Cable Corpcration

This article, which announces approval of the new American Standard Specifications for Heavy-Walled Enameled Round Copper Magnet Wire, (C8.20-1939), was prepared by Mr. Crowe, and presented for publication by M. A. Kent, chairman of the technical committee which prepared the new specifications. Mr. Kent is vice-president and director of manufacturing of the General Cable Corporation and a Director of The Wire Association.

HAVING completed revisions of the standard specifications for plain enameled, cotton-covered, and silk-covered magnet wires in 1936,[1] the Technical Committee on Magnet Wire of the ASA Committee on Specifications for Insulated Wires and Cables immediately set about preparing specifications for heavy-walled enameled round copper magnet wire, commonly referred to as "double-enameled" wire.

✦ ✦ ✦

AS plain enamel gradually displaced, to a large extent, the insulations previously used for magnet wire, the advantages and limitations of it as magnet-wire insulation became generally known. Chief advantages were its non-hygroscopicity, high dielectric strength, improved heat resistance, better "space factor" and relatively lower cost in finished wire. These were offset to some extent by its relatively poor resistance to abrasion conditions incident to winding and forming of coils. In order to obtain the advantages of enamel insulation and to offset its disadvantages, a composite insulated wire came into use where coil-winding operations or service conditions in electrical machinery or equipment were severe. Such wire consists of an enameled conductor over which one or more servings of abrasion-resistant material such as cotton yarn, silk yarn, or paper is applied. Of these the enameled-single cotton construction is in most general use. In fact, this magnet wire construction is second only to plain enamel wire in tonnage used.

✦ ✦ ✦

WITH technologic improvement in the manufacture of enameled wire, it was found that by building up the film thickness of the enamel a wire could be obtained which had most of the advantages of plain enameled wire and approached the abrasion-resistant characteristics of the enamel-single cotton or similar constructions. This heavy-walled (double) enamel wire then gradually found more and more uses and its volume increased to a sizeable proportion of the magnet wire output.

✦ ✦ ✦

PRIOR to the adoption of the specifications for heavy-walled enameled wire, manufacturers and users of this type of wire made and used so-called "double-enamel" wires varying in enamel film thicknesses from values slightly above plain (single) enamel to double or triple those values. Thus a large number of individual specifications were in existence and the need for standardization along lines similar to those adopted for plain enamel became apparent.

✦ ✦ ✦

IN setting up the specifications for "heavy-walled enameled round copper magnet wire" the Technical Committee considered the dimensional limits and performance requirements of the large number of specifications in use, and formulated requirements and limits that could be generally adopted by magnet-wire manufacturers and users without resort to major changes in manufacturing methods or equipment or in equipment design or operating procedures by the user.

✦ ✦ ✦

THESE specifications follow the form and general test requirements of the American Standard Specifications for Enameled Round Copper Magnet Wire (C8.7-1936) with limits, of course, which are consistent with the somewhat different characteristics of the finished wire. Thickness of enamel film for the full range of wire sizes is set up on a logical graduation from heavier films on the larger sizes to thinner films on the smaller sizes of wire.

✦ ✦ ✦

ILLUSTRATIVE of the insulation addition for heavy-walled enameled wire in comparison with other magnet wire constructions covered by American Standard specifications, the following table of three representative sizes of round magnet wire are shown. Values given represent maximum additions to diameter of the bare wire in inches due to total insulation:

Type	No. 8 AWG	No. 16 AWG	No. 26 AWG
Enameled Wire (C8.7-1936)	.0026	.0021	.0013
Heavy Walled Enameled Wire	.0044	.0035	.0024
Enamel-Single Silk (C8.6-1936)	—	.0041	.0033
Single Cotton Cover- (C8.5-1936)	.0106	.0071	.0058
Enamel-Single Cotton (C8.5-1936)	.0080	.0050	.0045
Double Silk Covered (C8.6-1936)	—	.0040	.0040
Double Cotton Covered (C8.5-1936)	.0140	.0095	.0085

(*Please turn to Page 231*)

Courtesy Industrial Standardization, Publication of The American Standards Association.

[1]See article "Industrial Trends Influence Changes in Three Magnet Wire Standards" by M. A. Kent, Industrial Standardization, Dec. 1936.

The Use and Application of Fuel Oil For Heating the Galvanizing Kettle

By W. G. Hartman,
Lewis Bolt & Nut Company, Minneapolis, Minn.

A paper presented before the American Hot Dip Galvanizers Association, Inc., at the 1940 Annual Meeting held at the William Penn Hotel, Pittsburgh, Pa., on Thursday, February 29th.

LAST year it was decided by our company to expand its galvanizing facilities. For several years prior to that time we had operated a galvanizing department, which department was established to care primarily for the Company's own galvanizing requirements. However, as time elapsed, the matter of better galvanizing became more important and, together with the fact that more outside concerns were calling upon us to do job galvanizing, it was felt that we should expand and enter into the galvanizing field on a larger scale.

✦ ✦ ✦

WE were, of course, confronted with many problems in the course of the design and layout of the new plant. Fundamentally a galvanizing plant is designed and built around and in accordance with the size of the pot which is contemplated to be installed. We finally decided to install a pot, the dimensions of which are 22′6″ long, 28″ wide and 4′ deep. The rest of the plant, of course, was built and designed in accordance with this pot size.

✦ ✦ ✦

OUR efforts were directed to the study of what kind of fuel should be used in connection with heating the kettle and our first thoughts were toward the use of city gas.

✦ ✦ ✦

WE have, in Minneapolis, a natural gas pipe line running from the southwestern part of the country. This gas is piped in and mixed with coke gas, and subsequently piped into the consumers' mains. The resulting mixture of the two gases have a B.T.U. content of 800.

✦ ✦ ✦

UP to this time, no satisfactory industrial gas rate has been established. The lowest rate obtainable, based on consuming in excess of one million cubic feet per month is 45 cents per thousand cubic feet; and this rate is arrived at, not on a flat basic rate, but on a sliding scale. A resume of this rate structure is shown in Table I.

TABLE I

$ 1.00	First	400	Cubic ft.	—	$1.00 per 1000 cu. Ft.
1.11	Next	1,100	" "	—	1.01
1.98	"	2,000	" "	—	.99
29.45	"	31,000	" "	—	.95
155.10	"	165,000	" "	—	.94
195.00	"	300,000	" "	—	.65
250.00	"	500,000	" "	—	.50
	Over	1,000,000	" "	—	.45

IF, therefore, we compute the average cost of the first million feet, we arrive at an average rate of 63.4 cents per thousand feet. Expressed in another way or on a cost basis per one hundred thousand B.T.U.'s, we arrive at an average cost of 7.92 cents per therm.

✦ ✦ ✦

SIMULTANEOUSLY we developed information as to the possibility of using fuel oil. Working in conjunction with the Vapofire Corporation whose equipment we subsequently installed, some interesting facts were revealed.

✦ ✦ ✦

BRIEFLY, this type of equipment does not burn fuel oil as such, but, through a process of vaporization, a gas is formed which gas is piped directly to the pot burners. Our actual experience with this type of fuel has been most favorable. The type of fuel recommended and being used is a number one fuel oil distillate having a B.T.U. content of 137,500 per gallon. The analysis of this fuel is as follows:

Gravity	**40 to 43**
Flash	**170° F**
Viscosity	**Approximately 32**
Sulphur	**No more than .2**

✦ ✦ ✦

THIS type of fuel delivered in Minneapolis in tank cars is costing us an average of 6.2 cents per gallon or approximately 4½ cents per therm. This compares to mixed gas as supplied by the Minneapolis Gas Company at 7.92 cents per therm. It is evident, therefore, that we are making our own gas at approximately 56 percent of city used gas. Based on our average overall production, our experience indicates that our fuel cost has amounted to 4.6 gallons per hour or 28½ cents. Further,

(*Please turn to Page 218*)

Exports and Imports of Wire

Exports of Iron and Steel Wire Products in Jan. 1940 and Jan. 1939
(In Gross Tons)

	JAN. 1940	DEC. 1939	JAN. 1939
Wire rods	9,295	6,820	353
Strip steel	18,271	12,872	7,225
Plain, black or galvanized iron or steel wire	9,746	9,481	4,140
Barbed wire and woven wire fencing	2,917	7,413	2,586
Woven wire screen cloth	182	168	143
Wire rope	809	916	242
Insulated iron or steel wire and cable—see analysis below			
Other wire and manufactures	1,226	2,109	570
Wire nails	5,358	4,520	1,528
Tacks	73	117	13
Other nails, including staples	329	558	309
Bolts, machine screws, nuts, rivets and washers	1,081	1,129	586
Total, these 11 classifications	49,287	46,103	17,695

Imports of Iron and Steel Wire Into the United States
(In Gross Tons)

Concrete Reinforcement bars	.....	.....	365
Hollow bar and drill steel	189	100	100
Wire rods	1,037	1,058	1,196
Barbed wire	.....	325	1,012
Round iron and steel wire	200	269	285
Telephone and telegraph wire	.....	1	1
Flat wire and strip steel	230	335	270
Wire rope and strand	81	106	240
Other wire	.....	8	240
Hoops and bands	305	265	1,894
Nails, tacks and staples	38	171	553
Bolts, nuts and rivets	5	13	12
Total, these 12 classifications	2,085	2,651	6,168

Exports of Insulated Wire and Cable, January 1940

	Foreign		To U. S. Possessions	
	Pounds	Dollars	Pounds	Dollars
Rubber-covered wire	792,610	$208,918	168,331	$ 33,250
Weatherproof wire	172,964	33,372	85,154	14,867
Other insulated copper wire	1,557,656	333,515	228,692	37,774
Nickel-chrome electric resistance wire	63,007	98,864	228	153
Total, these 4 classifications	2,586,237	$674,669	482,405	$ 86,044

Slight Gain Recorded in Iron and Steel Exports

Import Decline Continues

AT 396,064 gross tons valued at $31,153,365 January iron and steel exports topped those of December 1939—394,035 tons valued at $30,099,593—by the narrow margins of 2,029 tons and $1,053,772. A year ago—in January 1939—the trade in these same products had amounted to only 134,788 tons valued at $10,214,547.

✦ ✦ ✦

SHIPMENTS to European buyers rose from 72,657 tons in December, 1939 to 109,957 tons in January largely because of increased purchases by the United Kingdom, the Netherlands, and Norway. The trade with South America was slightly higher at 110,657 tons than that of December, 109,455 tons, with increased shipments to Argentina and Brazil offsetting reductions in the trade with Colombia, Peru, and Venezuela, while the trade with Africa reached 14,879 tons from 12,577 tons. These gains were, as noted above, largely offset by reduced shipments to other consuming areas—the trade with North and Central America and the West Indies declining to 77,515 tons from 91,579 tons principally because of reductions in the trade with Canada, while exports to the Far East—83,056 tons in January against 107,767 tons in December—reflect a sharp reduction in the movement of American iron and steel to Japan.

✦ ✦ ✦

Continued Decline in Imports

FOR the fourth consecutive month the United States import trade in iron and steel products (scrap excepted) registered a decline. Imports totaled only 7,832 gross tons valued at $920,533 in January, 1940 against a trade of 13,442 tons valued at $1,099,177 in December, 1939, and in contrast with the 24,331-ton, $1,729,145 trade of January, 1939.

✦ ✦ ✦

Scrap Exports Again Lower

EXPORTS of scrap from the United States in January, 1940 totaled only 187,457 gross tons in comparison with 206,402 tons shipped in December, 1939 and 227,884 tons in January, 1939. January exports are valued at $3,567,221 against a value of $4,064,358 for December and $3,351,351 for January, 1939.

✦ ✦ ✦

United Kingdom Heads List Of Purchasers

THE leading individual market in January was the United Kingdom with a total of 45,675 tons against 22,020 tons taken in December. The chief items in this trade were 32,222 tons of non-alloy ingots, and 10,361 tons of pig iron. In Canada's trade of 43,966 tons (50,504 tons in December) were included 8,515 tons of skelp, 7,978 tons of non-alloy "black" steel sheets, 6,833 tons of non-alloy hot-rolled strip steel, 3,301 tons of non-alloy "other" plates, and 3,243 tons of plain shapes. 6,878 tons of concrete reinforcement bars, 6,378 tons of tin plate, and 4,047 tons of wire rods were important items in Argentina's 37,735 ton-trade (30,396 tons in December).

✦ ✦ ✦

January Imports Drop

IN the 7,832-ton total of iron and steel imports ferromanganese was the most important item in point of tonnage—the entire 1,945 tons coming from Norway. Closely following that was the 1,914 tons of pig iron furnished by British India, 1,599 tons, and Canada, 315 tons. Sweden was the source of 963 tons and Belgium of 74 tons to make up a total of 1,037 tons of wire rods imported in January.

Sweden Leading Supplier

THE leading source of January imports was Sweden whose total of 2,515 tons included 963 tons of wire rods. Virtually all—1,945 tons—of the 1,996-ton trade with Norway was ferro-manganese, while pig iron comprised all of the 1,599 tons reported from British India. Imports from Canada total but 689 tons, while receipts from Belgium reached the low figure of but 667 tons.

✦ ✦ ✦

Scrap Exports Lower

JANUARY exports of scrap totaled only 187,457 gross tons against 206,402 tons in December with Japan, 108,718 tons; United Kingdom, 32,907 tons; and Italy, 31,692 tons the most important purchasers. Included in the 187,457-ton total were 185,653 tons of iron and steel scrap, 449 tons of tin plate scrap, 326 tons of tin plate circles, strips, etc., 795 tons of waste-waste tin plate, and 234 tons of terneplate clippings.

✦ ✦ ✦

CARD Clothing: 16,482 square feet and $20,354 (22,759 square feet, $32,873). 15,428 square feet, $18,096 was received from the United Kingdom, 804 square feet, $1,264 from Belgium, and 250 square feet, $994 from Switzerland.

✦ ✦ ✦

WIRE Cloth and Screening: 45,239 square feet (24,102 square feet) supplied entirely by the Netherlands, 43,934 square feet, and Canada, 1,305 square feet.

✦ ✦ ✦

WIRE Fencing and Netting: Galvanized before weaving: 75,000 square feet (45,000 square feet) furnished solely by Japan. **Galvanized after weaving:** None (none).

✦ ✦ ✦

FOURDRINIER: 6,267 square feet (23,914 square feet). Sweden was the source of 5,200 square feet and Canada of 1,067 square feet.

✦ ✦ ✦

WIRE Heddles: None (399,000 pieces).

✦ ✦ ✦

Wood Screws

EXPORTS of iron and steel wood screws during January, 1940 totaled 55,215 gross valued at $9,339. Of this total, Mexico took 13,030 gross valued at $1,109; Cuba, 5,919 gross valued at $1,206; Colombia, 5,826 gross valued at $1,290; Costa Rica, 5,098 gross valued at $799; Venezuela, 3,150 gross valued at $776; Canada, 3,093 gross valued at $282; Ecuador, 3,080 gross valued at $752; Bolivia, 2,786 gross valued at $491; Peru, 2,598 gross valued at $391; Guatemala, 2,355 gross valued at $480; Paraguay, 2,214 gross valued at $255; Salvador, 1,202 gross valued at $240; Honduras, 1,111 gross

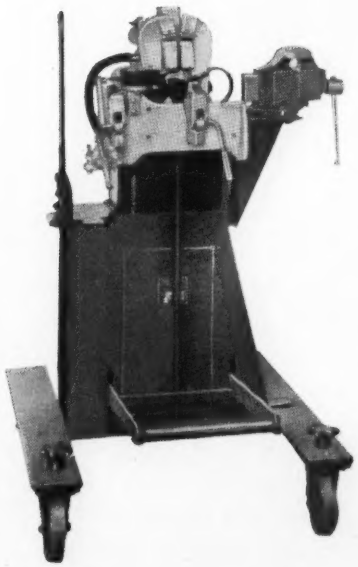
(*Please turn to Page 218*)

MICROMETER PRECISION MICRO-WELD TRADE MARK REG. U. S. PAT. OFF.

CONTINUOUS IMPROVEMENT

MICRO-WELDERS with dial indicating annealing attachments are now available for high carbon wire.

There is positive control of annealing temperature and already hundreds of these special MICRO-WELDERS are proving their dependability and satisfactory performance with leading manufacturers.



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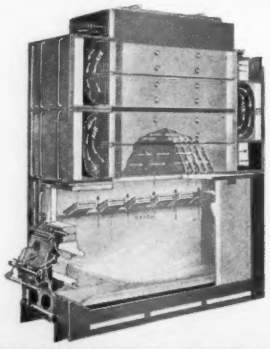

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J. O. ROSS ENGINEERING CORPORATION

350 MADISON AVE., NEW YORK, N. Y.

CHICAGO, ILL. DETROIT, MICH. PITTSBURGH, PA.

ROSS ENGINEERING OF CANADA, LTD., Dominion Square Building, Montreal

Exports and Imports of Wire

(*Continued from Page 217*)

valued at $323; Brazil, 1,061 gross valued at $236; Union of South Africa, 1,034 gross valued at $269.

✦ ✦ ✦

EXPORTS of brass wood screws during the same month totaled 8,390 gross valued at $3,563. Of this total, Cuba took 3,641 gross valued at $847; Panama Canal Zone, 1,855 gross valued at $970; Colombia, 980 gross valued at $523; Azores & Madeira Is., 407 gross valued at $301; Canada, 364 gross valued at $236; Costa Rica, 200 gross valued at $68; Mexico, 191 gross valued at $36; Netherlands West Indies, 137 gross valued at $78; Honduras, 104 gross valued at $147.

✦ ✦ ✦

IMPORTS of wood screws during the same month totaled 25,200 gross valued at $2,642, supplied by Belgium, 20,200 gross valued at $2,506, and Japan, 5,000 gross valued at $136.

✦ ✦ ✦

The Use and Application of Fuel Oil for Heating the Galvanizing Kettle

(*Continued from Page 215*)

it is to be noted that the cost per ton of finished work amounts to 23.2 cents.

✦ ✦ ✦

I AM unable to state whether or not these cost figures are favorable when compared to those in regions having natural and more favorable fuel resources close at hand; however, in our own particular location, it is quite apparent that we are operating on a much lower fuel cost basis than had we purchased mixed gas.

✦ ✦ ✦

I WILL attempt to briefly describe the mechanics of this equipment. Fuel oil is pumped from our bulk storage tank to a small tank, by a ¼ horse power motor. The smaller tank is placed some 6′ above ground. Through a float valve which automatically operates a switch, oil in the smaller tank is held at a constant level or pressure. From this smaller tank the fuel oil flows by gravity into

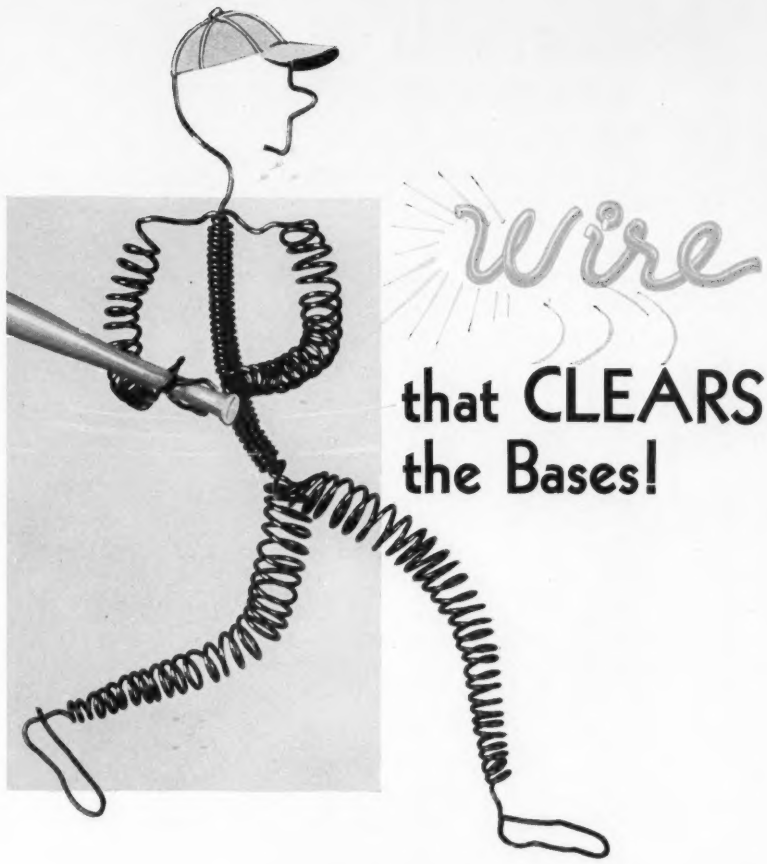
the bottom of a cylinder or carburetor. Oil in the cylinder is heated by fuel oil gas, which is bypassed back from the discharged side of the cylinder or mixing chamber. The vaporized and expanded gas is passed to the top of the cylinder where it comes in contact with a stream of air. This air becomes saturated and passes along into the discharge line. The air is furnished by a blower at 300 cubic feet per minute and at a pressure of 16 ounces. The blower is operated by a 1½ horse power motor.

✦ ✦ ✦

A SINGLE valve to control the rate of flow of fuel oil in the mixing chamber governs the volume of gas produced. This variable control has a wide range running from a low point of 2¼ gallons per hour to a maximum of 11 gallons per hour. Thus, when the plant is not operating, the amount of oil used can be reduced to a minimum by reducing the flow of oil and adjusting the volume of air which is being pumped into these mixing chambers. At the same time, of course, the correct number of valves located at the burners are shut off.

✦ ✦ ✦

ALTHOUGH we have had no direct experience as far as pot life with this type of heating equipment and its effects on pot life, we have reason to believe that we will obtain up to four years of service from the pot. In consideration of this point it might be stated that in the pot setting, no flame impinges directly on the pot. The flame itself burns very gently, demonstrated by the fact that air is introduced at a pressure of only one pound. To eliminate moisture from entering the heat chamber, a condensate return line is provided in connection with the fuel line. The fuel oil itself, of course, has a small sulfur content which decreases the amount of oxidation occuring on the fire side of the pot. By the elimination of these corrosion factors, it is self evident that at least a reasonable pot life will be obtained. To eliminate the



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If orders or production quota have become backed up — because of not quite correct hardness, finish, gauge, analysis, tensile strength or elasticity — let us supply you a few samples of regularly stocked Keystone wires. Try them in your regular processing. Or, pitch us your problem, and let the Keystone technicians "go to bat" for you.

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Just about every producer of lead encased cable uses Robertson Presses . . . and this is true not only in the United States, but in Canada and in many foreign countries as well!

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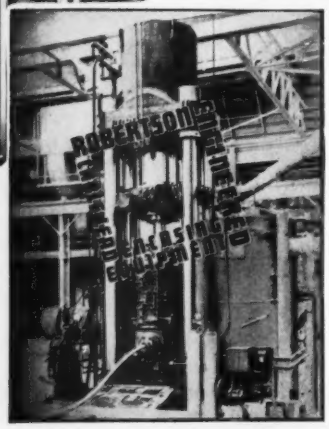

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JOHN ROBERTSON COMPANY INC.
125-137 Water Street
Brooklyn, New York

The Use and Application of Fuel Oil for Galvanizing Kettles

(*Continued from Page 219*)

possibility of production delays or freezing of the pot through fuel source failure, we have piped city gas into the plant as a standby. This city gas would pass through the same equipment and be used as our own fuel oil gas. Of course this serves only in emergencies or as a standby fuel supply. So as to avoid the necessity of long delays in waiting for parts, we have provided ourselves with a spare blower and motor for operating the blower, these two parts being the only moving parts in the whole system. It is felt that we have provided ourselves with ample protection against fuel failure.

✦ ✦ ✦

THIS type of fuel is quite versatile in that it can be piped approximately 40 to 50′ and still be efficient. It may be noted that we have considered the use of this fuel as a source of heating our pickling solution by using immersion tubes.

✦ ✦ ✦

IN closing I would like to make one more point relative to our dross experience as it relates to this form of fuel. Our plant is in a territory in which the volume of any one product to galvanize at one time is probably comparatively small; for instance, one day's work may involve the galvanizing of castings both gray iron and malleable, structural steel, stampings, and a multitude of miscellaneous fabricated steel items, both large and small. Based on this type of general galvanizing business, our first six months dross loss indicates a dross accumulation of 54 pounds per ton of finished work.

✦ ✦ ✦

Dilec Electrical Conductors

DILEC electrical conductors and the organization behind this trade name were announced in the February issues of electrical industry trade papers reaching contractors, wholesalers, engineers, industrials, architects and many other interested groups.

THESE wires and cables are made with the new type of fibrous covering composed of a series of cotton yarns laid side by side in contact relation, overlaid by a special rayon binder thread. This method provides 100% coverage of the rubber insulation as compared to about 60% coverage by the braided type. Regardless of the thickness of insulation this new covering results in a wire with a smaller overall diameter by reason of the fact that it eliminates all thread crossovers that are necessarily present in the braid.

✦ ✦ ✦

THESE wires and cables have all the flame-retarding and moisture-resisting qualities of the original Safecote wire plus the new type fibrous covering. Their smooth surface makes it possible to permanently and legibly print on the surface of the wire the trade name Dilec, the manufacturer's name, the type, size and voltage of the conductor together with a length marker every two feet to facilitate measuring. This smoothness, plus these small diameters, plus the improved lubricated covering gives Dilec fishing qualities heretofore unattained by any other wire.

✦ ✦ ✦

DILEC electrical conductors have been tested and approved by the Underwriters' Laboratories and George C. Richards, Licensor's Agent, with offices at 155 East 44th Street, New York City, announces that Dilec wires and cables are now made by several prominent wire manufacturers.

✦ ✦ ✦

Charles P. Gulick

CHARLES P. GULICK, one of the founders of the **National Oil Products Company**, Harrison, New Jersey, today was reelected President of the company after a two years' absence from that post. Mr. Gulick, who left the presidency in June, 1938 to become Chairman of the Board, will also serve as Board Chairman. The company has offices and plants in Harrison, Chicago, Boston, Cedartown (Atlanta), Ga., and Emeryville (San Francisco), Calif.

MR. GULICK succeeds John H. Barton who retired as President on March 1st. Officers reelected were: Perc S. Brown, Vice-President; G. D. Davis, Vice-President; Thomas A. Printon, Vice-President; Ralph A. Wechsler, Treasurer; A. A. Vetter, Secretary. These men were also reelected directors of the company. Other directors reelected are Richard N. Gulick and William A. Coolidge.

THE directors were elected by the stockholders who met today at the Harrison plant. Stockholders also voted to reduce the Board of Directors from nine to eight as the result of Mr. Barton's resignation.

✦ ✦ ✦

IN addition, the stockholders approved an increase in the Capital Stock structure from 200,000 shares of $4.00 Par Common to 300,000 shares.

Syncro has the answer . . . . to your problem!

• You face the problem of producing quality wire at the lowest possible cost so as to enable you to return a profit on the investment represented by your plant and equipment.

• And Syncro can help you solve this problem. For the entire line of Syncro machines are superbly designed and constructed — to insure the quality of your product and to keep your production costs at the minimum.

• Whether you are interested in wire drawing machinery, insulating machinery for applying all materials (including cellulose acetate, paper, silk and cellophane), taping heads, capstans, annealing and tinning units or allied machinery, we believe that the modern Syncro line will give you the most for your money.

• May we quote on your requirements?

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420 Lexington Avenue, New York — McCormick Bldg., Chicago

Represented in Canada by — Canadian Elevator Equipment Co., Ltd., Toronto

'Round the World With the Wire Industry

THE expected boom which was anticipated by the non-combatant countries has not materialized. The neutral countries suffer heavily. Exchange reserves in Scandinavia are dwindling, foreign trade is adverse and unemployment very high. In Denmark 32.3% of all workmen were unemployed at the end of 1939. The wire industry meets considerable raw material difficulties. Denmark had to cut down raw material supplies severely and all imports of Swedish wire rods had to be stopped as Sweden is buying very little in Denmark. Sweden is also curtailing imports as is Norway. Supplies from Germany have been fixed at normal quantities, but it is not yet certain whether or not import permits from America will be given in Scandinavia for substantial quantities of wire rods. The industry is facing reduced working operations, with the exception of Sweden; however the demand in Sweden is not very good. The extraordinarily severe winter weather has hampered all trade on the Balkans and business there has virtually come to a standstill. Italian industries are busy and operating as much as they can but they have certain raw material difficulties. It is now planned to construct a large wire rod plant near Genoa, capable of turning out 50,000 tons of rods annually; no further extensions of the Italian wire works being known. The Dutch wire industry is maintaining operations, but the Belgians had to curtail work in some plants, as production of raw steel is very greatly hampered by lack of coal. In Luxemburg, steel production is only 58% of last year's average. The Belgian industry was able to resume export business with a number of countries amongst which was Latin America. These markets were abandoned by the Belgian industry at the beginning of the war, but sales are now nearly normal, whereas the Far Eastern business is very small. The German industry is operating now, as before, in Northern European, Balkan and Near Eastern markets but as regards the extent of the Overseas trade and how much is shipped via Italian ports, no details are available. However, the quantities will not be very great. Prices for all wire products are unaltered, being about the same as last month. Barbed wire is a little cheaper, selling at about $80 per ton. Bright wire is up and selling at about $63 per ton. The future development is uncertain and European makers do not believe in any great upward movement of business and prices. The consumption of wire products by the belligerent countries has so

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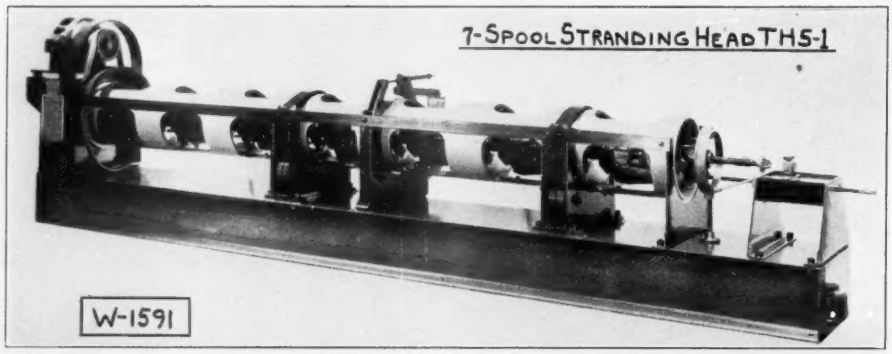


ELECTRICAL WIRE, CABLE & WIRE ROPE MACHINERY

Printed Literature Available On Considerable Of The Equipment Used In These Fields—Inquiries Are Invited

far been negligible. The wire machinery business is satisfactory. Germany will hold a big show of modern wire machinery at this year's Spring Fair in March. Russia continues to be the main buyer.

✦ ✦ ✦

Lack of Brazilian Market for Metal Fencing

ACCORDING to a recent report requested by the Bureau from the office of the American Commercial Attache at Rio de Janeiro, Brazil offers little or no market for chain link fence or other metal fence and fence posts. The original cost, high custom duties, high transportation, insurance and other incidental costs, along with reduced foreign exchange and the low cost and ready availability of materials for building usual types of fence (walls), contribute to make difficult the importation of manufactured metal fencing. It is suggested in the report received that the only type of imported metal fencing which might find a market in the important cattle states of Brazil is the one-wire electric fence with power accessories.

✦ ✦ ✦

War Time Emergency and Skilled Workers

THE Government of India is reported to be in close touch with iron and steel manufacturers taking stock of the total strength in skilled workers in the industry. It is believed that advance knowledge with regard to the resources of skilled workers within the industry will in case of necessity enable the Government to withdraw or reallocate some of the skilled workers without dislocation of work in the plants.

✦ ✦ ✦

Shortage of Iron and Steel In New Zealand

MORE or less serious shortages are reported to exist in New Zealand for the following types of iron and steel products: nail wire, pig iron, galvanized wrought iron pipe, galvanized corrugated sheet iron, and fencing wire.

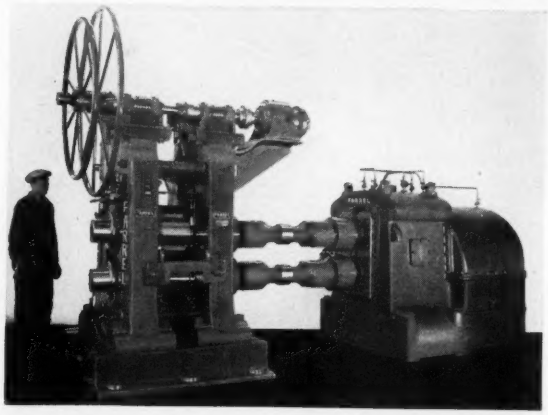
Proposal to Establish Cable Factory in Spain

THERE was published in the Boletin Oficial of January 5, 1940 a resume of a proposal to establish in the Province of Vizcaya a factory for the manufacture of all types and kinds of cable. According to report submitted by the office of the American Commercial Attache at Madrid the petition was submitted on behalf of Luis Solaun e Igartua, Calle de Prado 4, Guecho, Vizcaya, Spain. The projected production of the factory has been set at 500,000 meters of armoured cable and 15,000,000 meters of so-called insulated conductors per year. The new plant, if approved, will require a great variety of machinery at an estimated value of 1,295,390 pesetas which will have to be obtained from foreign sources.

(*Please turn to Page 227*)

FARREL ROLLING MILL

PERFORMS COMPLETE RANGE OF ROLLING OPERATIONS ON WIDE VARIETY OF METALS



This 16″ x 16″ two-high rolling mill is an example of Farrel engineering *to fit the job.* In this case the job was the rolling of a wide variety of metals, including copper, brass, bronze, silver, nickel silver, monel metal, bi-metals and semi-precious metals. Production requirements dictated a mill that could be used for all rolling operations from breaking-down to finishing, and one of heavy, rugged construction to handle large reductions.

The mill has forged, heat-treated, alloy steel rolls . . . . heavy Meehanite housings . . . . force-feed, grease-lubricated, plain, bronze bearings . . . . combination double-handwheel screwdown with motor drive for rapid approximate positioning of the top roll . . . . hydraulic top-roll counterbalance . . . . Meehanite delivery and feed tables . . . . adjustable side guides on feed table . . . . a wiper on each roll . . . . and a safety bar tripping device for quick stopping in an emergency.

The reduction gear drive and pinion stand are combined in an integral unit, with Farrel-Sykes continuous tooth herringbone gears and mill pinions mounted in anti-friction roller bearings. Gears and bearings are force-feed lubricated. A Farrel Gearflex Coupling connects the motor and drive and universal spindles connect the pinion stand with the mill.

Designing and building mills such as this to meet particular requirements is a specialty of Farrel-Birmingham. If you have a special mill problem our engineers will be glad to consult with you.

FARREL

FARREL-BIRMINGHAM COMPANY, Inc.
ANSONIA, CONN.
New York • Buffalo • Pittsburgh • Akron • Chicago • Los Angeles

A Review of Recent Wire Patents

No. 2,189,090, HIGH FREQUENCY SIGNALING CABLE, Patented February 6, 1940 by Franz Unterbusch, Cologne-Mulheim, Germany, assignor to Felten & Guilleaume Carlswerk Actien-Gesellschaft, Cologne-Mulheim, Germany.

The bands, which serve as a supporting member for the return conductor are wound with a long pitch by a helix of polystyrol.

✦ ✦ ✦

No. 2,189,091, FLEXIBLE HIGH FREQUENCY CABLE, Patented February 6, 1940 by Franz Unterbusch, Cologne-Mulheim, Germany, assignor to Felten & Guilleaume Carlswerk Action-Gesellschaft, Cologne-Mulheim, Germany.

A wire braiding outer or return conductor is supported and spaced from the central conductor by a metal band wound in the form of an open helix.

✦ ✦ ✦

No. 2,189,557, METHOD OF AND APPARATUS FOR THE PRODUCTION OF COILED HANKS OF WIRE. Patented February 6, 1940 by Donald George Ashcroft, Saltcoats, Scotland, assignor to Imperial Chemical Industries Limited, a corporation of Great Britain.

These coiled bands of wire are particularly adapted for electric blasting detonators and comprise relatively short lengths of wire having insulated double wire leads of various lengths.

Complete Descriptions and Drawings of Patents May Be Had for 25 cents. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

No. 2,189,785, WIRE PROPELLER BLADE, Patented February 13, 1940 by Delmer S. Fahrney, United States Navy.

This blade comprises a light cast metal skeleton of propeller blade contour having a number of corrugations longitudinally thereof, a number of tensile wires laid in the corrugations and secured at each end of the blade, a number of transverse bands spaced along the blade over the longitudinal wires, and a number of wire wrappings about the longitudinal wires between the spaced steel bands, each turn of the transversely wrapped wire being spot welded at each adjacent turn.

✦ ✦ ✦

No. 2,189,876, WIRE REDUCING MACHINE, Patented February 13, 1940 by Lee Berkebil, Detroit, Mich., assignor to B. W. Manufacturing Company, Detroit, Mich., a corporation of Michigan.

The assembly includes a powder box with a hollow shaft journaled in a wall of the box, a die holder within the box at the inner end of the shaft, the periphery of the holder having longitudinally extending grooves, a die secured in the holder, and a driving connection between the shaft and holder including pins projecting endwise from the shaft, and engaging the longitudinally extending grooves in the periphery of the holder.

✦ ✦ ✦

No. 2,190,017, ELECTRIC CABLE, Patented February 13, 1940 by William A. Del Mar, Greenwich, Conn., assignor to Phelps Dodge Copper Products Corporation, New York, N. Y., a corporation of Delaware.

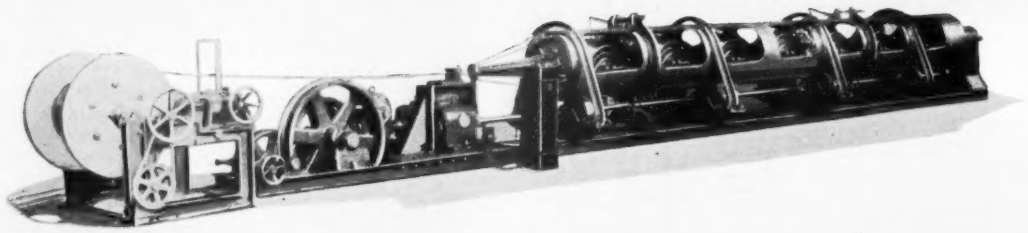
Between the central wire conductor and sheath is an impregnated paper insulation composed of two or more types of paper differing in ratio of elongation to tensile stress, tre types of paper being applied in decreasing order of this ratio from the conductor outward.

✦ ✦ ✦

No. 2,190,129, CHAIN FORMING MACHINE, Patented February 13, 1940 by Frank E. Stahl, Tonawanda, N. Y.; Lillie M. Stahl, administratrix of the estate of said Stahl, deceased, assignor to Columbus McKinnon Chain Corporation, Tonawanda, N. Y., a corporation of N. Y.

Used, for instance, as cross chains for anti-skid devices, the chain formed by this machine is made of wire with an irregular cross section, as disclosed in

Announcing the New 1940 Model National Tube Type Strander



THIS Strander is equipped with variable speed haul-off eliminating the use of change gears. With the new National Strander, changing lay lengths is but a matter of seconds.

✦ ✦ ✦

CHANGING from right lay to left lay requires only the shifting of clutch lever; electric brakes of latest type add much to the efficiency of operation.

✦ ✦ ✦

THIS Strander is equipped with ball-bearings throughout, has Textilite tube rollers and Carboloy wire guides, quick operating bobbin latches and bobbin brakes.

✦ ✦ ✦

Made for 9", 12", 16" and 22" standard bobbins.
Equipment for Wire and Rubber Industries.

NATIONAL RUBBER MACHINERY CO.

General Offices: AKRON, OHIO

Banner Division, COLUMBIANA, OHIO
Eastern Division, CLIFTON, N. J.

David Bridge & Company, Ltd., Manchester, England
The Bawden Machine Company, Ltd., Toronto, Canada

U. S. patent 1,786,318 dated December 23, 1930.

✦ ✦ ✦

Reissue No. 21,360, MANUFACTURE OF PAPER MAKER'S WIRE CLOTH, Patented February 20, 1940 by Willie Dunstan Theodore Green, Edinburgh, Scotland, assignor to The United Wire Works, Limited, Granton, Edinburgh, Scotland.

The method, in this invention, includes: selection of round warp wire of suitable size and material, selection of round weft wire of suitable material and of a diameter not less than the diameter of the warp wire, interweaving the warp and weft wires so that each warp wire passes over one and under two weft wires thereby forming warp knuckles and long sloping weft crimps, the warp and weft wires being interwoven in such ratio that the long weft crimps have crests in substantially the same plane as the crests of the raised warp knuckles, and removing material from the raised projecting warp knuckles to bring them into the same plane with the crests of the long weft crimps and thereafter removing material from both the raised warp knuckles and the long weft crimps to produce flat spots level with one another on both the warp and weft wires.

✦ ✦ ✦

No. 2,190,883, LOCK NAIL, Patented Joseph L. Pauze, Two Rivers, Wis.

Spurs are provided in spiral rows about the nail shank. These spurs project toward the head of the nail.

✦ ✦ ✦

No. 2,191,463, METHOD AND APPARATUS FOR RECOILING METAL COILS, Patented February 27, 1940 by Agnes J. Reeves Greer, Morgantown, W. Va.

The method consists in winding the metal spirally upon itself in one direction to form a coil each convolution of which has a plurality of irregularly spaced angular bends therein and then holding the outer end of the coil against movement and positively rotating the inner end of the coil in the opposite direction to separate the convolutions of the coil.

✦ ✦ ✦

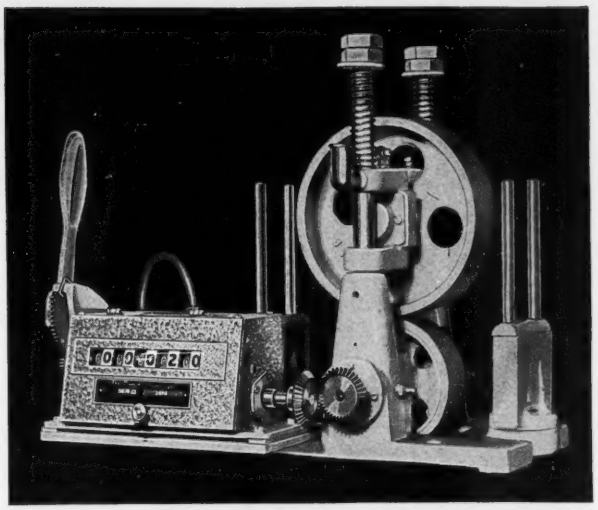
No. 2,192,101, SPIRAL SPRING, Patented February 27, 1940 by Leonard C. Peskin, Worcester, Mass., assignor to The American Steel and Wire Company of New Jersey, a corporation of N. J.

This spring is of the powering type, as used in watches, clocks, etc. and an object of the invention is to reduce friction between adjacent convolutions.

✦ ✦ ✦

Lindsay Wire Weaving To Build New Plant

THE Lindsay Wire Weaving Company, manufacturers of wire cloth with a plant in Aspinwall Avenue, Cleveland, has let the contract for a building to replace its original main works in this city. The James C. F. Shafer Company has the general contract for a building which will be erected without interfering with operations in the present plant. This will be accomplished by erecting the new plant in units.



Now a

Wire Measuring Machine for Every Purpose

The recent addition of several new models enables us to offer wire and cable manufacturers and users, machines for the fast, accurate lineal measurement of any kind of bare and insulated wire, twisted pairs, wire rope and lead-covered or armored cable. Capacities .005" dia. and up.

Write for bulletin giving description and prices of Productimeter Wire Measuring Machines and Braiding Machine Counters.

DURANT MFG. CO.

1918 N. Buffum Street
Milwaukee, Wisconsin

176 Eddy Street
Providence, Rhode Island

WHEN YOU COME TO

THE WORCESTER REGIONAL MEETING

— Scheduled for Thursday, April 11th —

YOU WILL WANT TO SEE THE VERY FIRST PROPORTIONAL REACTIVE (BACK PULL) WIRE DRAWING MACHINE IN OPERATION.

The Ideal Machines for your Experimental, Development and Research Depts.

(Manufactured and sold under Smith-Stringfellow Patents)

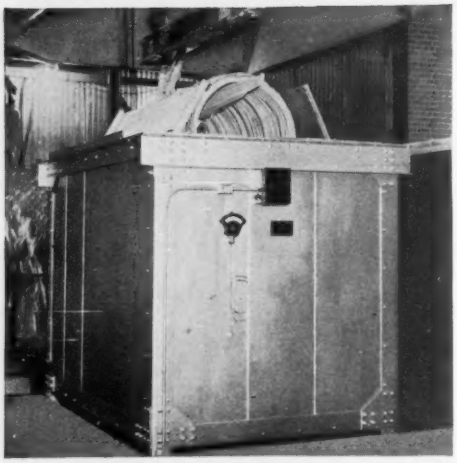
ADDRESS OR CALL TELEPHONE 6-1181

REACTIVE WIRE DRAWING

Room #36, Central Exchange Bldg., Worcester, Mass.

CARL-MAYER HI-SPEED TRADE MARK ROD BAKER

Far Ahead in comparative tests!



Large savings per pin in baking time.

Produces work of highest calibre.

Heavy Duty Construction.

Carl-Mayer Hi-Speed Rod Bakers have a more efficient heating and ventilating system . . . The patented Blow-Off feature removes moisture without rolling, bumping or agitating the coils . . . Write for complete details.

Illustration shows a Carl-Mayer Hi-Speed Rod Baker in a large Canadian steel plant.

OVER 20 YEARS EXPERIENCE

The CARL-MAYER Corp.
3030 Euclid Ave., CLEVELAND. OHIO.

Announcing the

"STANDARD"
Fluid Drive Take-Up Reel

(Patent Applied For)

Incorporating—

1. **Fluid Drive Tension Adjustment** which makes speed synchronization completely automatic for increased bundle diameter. Uniform tension—set by micrometer regulation of relief valve. (Far superior to usual "slipping clutch" mechanism.)

2. **Hydraulic Control** which provides uniform traverse for whatever width of stock is to be bundled. (More flexible than screw or cam traversing methods.)

If interested, write for details, address—

IT'S STANDARD PRACTICE

MACHINERY COMPANY
PROVIDENCE, RHODE ISLAND

Protective Compound for Stainless Steel During Transportation

A NEW metal protecting compound to be used in conjunction with ordinary wrapping paper for the protection of stainless steel sheets and materials during storage, fabrication and shipping has just been announced by Paisley Products, Inc., 1770 Canalport Ave., Chicago, Ill. and 630 W. 51st Street, New York City.

✦ ✦ ✦

ACCORDING to the manufacturer, this new compound is brushed on the metal and the paper is spread over the coating. It is claimed the paper will lay perfectly smooth, effectively protecting the metal against abrasion and scratches during the handling and the flat paper covering affords an excellent surface for lay-out work.

✦ ✦ ✦

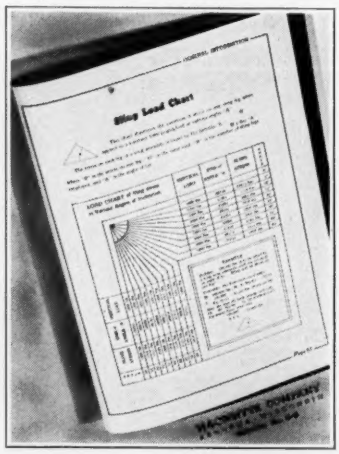
TO remove the paper and compound, the manufacturer states, simply wash off with warm water.

✦ ✦ ✦

New, Comprehensive Handbook On Slings

THIS latest publication by the **Macwhyte Company** was written specially for use by safety men, superintendents, engineers, purchasing agents, and all others concerned with handling problems (where slings are employed). Containing 56 pages of information, the handbook includes many reference tables and photographs.

✦ ✦ ✦



LATEST information on sling designs, capacity and weight

comparisons of slings, wire rope, and chain; tables for safe working loads; typical assemblies; crane signals; breaking strength and weight comparisons — these are typical of the information contained in the handbook.

✦ ✦ ✦

ACCORDING to the Macwhyte Company, copies of the new Sling Handbook may be had by simply writing, on company letterhead, giving name and title, to Macwhyte Company, Kenosha, Wisconsin.

✦ ✦ ✦

'Round the World with the Wire Industry

(*Continued from Page 223*)

War-Time Prices of Steel in South Africa

SOUTH African representatives of American steel manufacturers are disturbed over the steadily rising prices of steel and inability to meet competition from Great Britain, Australia, and Canada. It is reported that current quotations for M. S. steel plates by some of the larger American producers is $60.00 per long ton F.O.B. factory with freight paid to port of shipment. At the present rate of exchange this means a price of £15. 0. 0. per ton to the South African buyer as compared to a pre-war price of £10. 0. 0. laid down at port of delivery. Increased freight rates, insurance and exchange differentials are said to account for the majority of the increase in price, however, American producers' prices have increased more than those of British and Australian producers. It is rumored that England, in her efforts to retain export markets, is satisfying her home needs, as far as possible, by purchasing abroad and using the output of her own factories to satisfy her foreign buyers. This policy, according to report rendered by the office of the American Commercial Attache at Johannesburg, is based on the theory that it will be easy to regain her home markets, while experience from the last war has proven the difficulty in reestablishing export trade.

A New Type Paraffine Wax Emulsifier

DEVELOPMENT of a paraffine wax emulsifier for use in all processes and products where wax is needed has been announced by the Technical Service Department of National Oil Products Co., Harrison, N. J.

✦ ✦ ✦

THIS new emulsifier, named NOPCO 2251, is a heavy, tan colored paste that is mixed with paraffine wax to make the wax water dispersible or emulsifiable, chemists state.

✦ ✦ ✦

IN a laboratory report, the Technical Service Department reported:

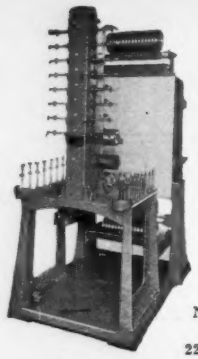
"The new emulsifier is a chemically compounded material which, upon rendering the wax water soluble, is capable of producing a stabilized emulsion spontaneously and without the application of energy in the form of rapid agitation or shearing effect, for example as obtained in a colloid mill. No special equipment is necessary."

PORTER
WIRE CUTTERS
Any wire, anywhere — on the bench, in the wreckage, on the pole or on the ground — hard wire, stranded wire, insulated wire — a Porter tool will cut it easily and quickly.
ASK FOR CATALOG
of Porter Cutting Tools — see Bench Cutter for shop use. See Electric Wire Cutters with insulated handles. See Cable Cutter for ¾" soft rope or ⅝" hard rope. See the entire Porter line of precision built portable cutting tools with valuable information about tool selection and use.
HKP
PORTER CUTTERS
H. K. PORTER, Inc.
Everett Mass.

Manufacturers of materials, tools and equipment for wire drawing and forming plants are constantly making improvements and additions to their lines. If you do not find the product or service in which you are interested, additional information will be supplied promptly. Simply address:

WIRE & WIRE PRODUCTS
Stamford Trust Co. Bldg.,
300 Main St. Stamford, Conn.

A NEW CATALOGUE
covering
AUTOMATIC SPARK-TESTING, MEASURING, REELING AND COILING EQUIPMENT
for the
WIRE, HOSE AND SHEET INSULATION INDUSTRIES
WILL BE READY MAY 1st, 1940.
RESERVE YOUR COPY NOW ! ! !
INSULATED WIRE MANUFACTURERS. Be Prepared for the Rapidly Increasing Interest in Spark Testing.
JAMES L. ENTWISTLE
88 PLEASANT STREET PAWTUCKET, RHODE ISLAND



AIMCO R-16 MODEL
WIRE ENAMELING MACHINE

Enamels Wire 36 B. & S. Gauge and Finer.
Electrically Heated Oven with Thermostatic Control.
Finished Wire Spindles Individually controlled.
Traverse is Adjustable for Different Spool Dimensions.
Ease of operation and number of spindles one operator can tend give low cost for enameling wire.
Self-Contained on Bed-Plate.
Motor Driven.
Motor included.

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"American" INSULATING MACHINERY COMPANY
REG. U.S. PAT. OFF.

New England Sales Representative:
SIDNEY B. BLAISDELL
228-232 Aborn St., Providence, R. I.

517 West Huntingdon St.
PHILADELPHIA PENNSYLVANIA U.S.A.

WIRE NAIL MACHINERY

These machines are made in eleven different sizes. This enables us to cover any size of nail most efficiently.

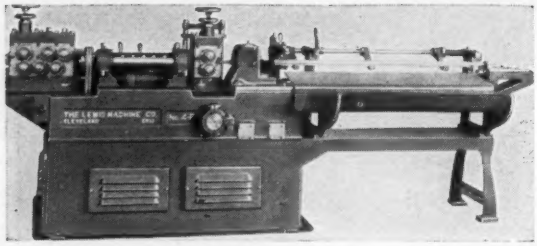
GLADER Nail making machines have been adopted as standard equipment in all recent major nail mill installations.

For further information, prices, etc., write to us.

Wm. Glader Machine Works

210 N. RACINE AVENUE, CHICAGO, ILL.

LEWIS TRAVEL-CUT WIRE STRAIGHTENING and CUTTING Machines



Machines for 1/16" to 3/4" rod
Round
Square
Flat
Hexagon
Ferrous and Non-Ferrous

Automatic
High Speed
Heavy Duty

The Sign of Dependable Service:
WE CAN SUPPLY AND ENGINEER OUR TOOLS EQUIPPED WITH CARBOLOY CEMENTED CARBIDE

THE LEWIS MACHINE CO., 3445 E. 76 St., Cleveland, Ohio

Wire Bunching Machines

NEW TYPE — HIGH SPEED
SELF CONTAINED — EASILY MOVED

Will produce 4,500 to 36,000 feet of bunched wire per hour.
Reel capacity 350 lbs.

Write for complete information today.

New England Butt Company

DEPT. W-4 PROVIDENCE, R. I.
CHICAGO OFFICE — 20 NORTH WACKER DRIVE

Alva L. Kitselman

ALVA L. KITSELMAN, 84, president and founder of Kitselman Brothers, fence manufacturers of Muncie, Indiana, died March 4 at Loma Linda, California.

✦ ✦ ✦

MR. KITSELMAN was a pioneer inventor and manufacturer of wire fence and fence weaving machinery. In the early 80's, he invented a hand-driven loom which wove fence in the field. Later he designed and patented a number of power looms for the manufacture of fence and netting and originated styles of fabric which now are standard for the industry. He was the eldest and last survivor of four brothers who, during their lifetimes, were active in the affairs of the company.

✦ ✦ ✦

Blaeser Elected by Hot Dip Galvanizers

A. J. BLAESER, Joslyn Mfg. & Supply Co., Chicago, was elected president of the **American Hot Dip Galvanizers' Association** at the annual meeting held in Pittsburgh March 1. Other officers: F. P. Auxer, National Telephone Supply Co., Cleveland, first vice president; Phelps Ingersoll, Wilcox Crittenden & Co., Inc., Middletown, Conn., second vice president; and Stuart J. Swensson, Pittsburgh, re-elected secretary-treasurer.

✦ ✦ ✦

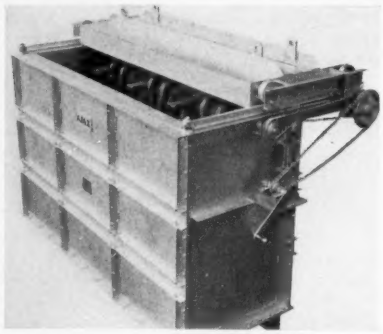
IN addition to Messrs. Blaeser, Auxer and Ingersoll, new directors of the Association include I. M. Herrmann, Acme Galvanizing Co., Milwaukee; T. M. Gregory, Hanlon-Gregory Galvanizing Co., Pittsburgh; J. B. Tate, Witt Cornice Co., Cincinnati; and Clem Stein, International-Stacy Corp., Columbus, O.

APCO MOSSBERG CO.
the original Frank Mossberg Co.
Manufacturers of Reels and Spools
Attleboro, Mass.

The Ajax-Hultgren Heating Principle

THE Ajax-Hultgren heating principle, now widely used in salt baths for carburizing, hardening, and the treatment of high speed steel tools has now been applied commercially to large nitrate baths for the heat treatment of aluminum alloys.

✦ ✦ ✦



THE photo shows a unit in which the pot measures 84″ long, 24″ wide, 46″ deep. The three pair of electrodes arranged along the back wall of the pot eliminate the need of any heating elements, since the heat is generated directly in the salt bath by virtue of its resistance to the flow of current between the narrow electrode gaps.

✦ ✦ ✦

THE electrodes are so arranged and proportioned as to produce an automatic circulation of the bath by means of electromagnetic forces generated at the electrodes. This patented operating principle assures extreme uniformity of temperatures throughout the pot contents, and virtual elimination of any maintenance expense, since no heating element replacements are necessary.

✦ ✦ ✦

THE furnace has a working temperature range from 450 F. to 1100 F. covering the annealing and precipitation hardening of all aluminum alloys such as sheet, stampings, structural shapes, castings and forgings.

✦ ✦ ✦

Fansteel Report Shows Substantial Growth

GROWTH, progress and a substantial increase in net earnings are the keynote of the 24 page illustrated 1939 annual report of Fansteel Metallurgical Corporation, North Chicago, Illinois, now ready for distribution to stockholders.

✦ ✦ ✦

AGGREGATE net sales show an increase of 75% over 1938. Consolidated net earnings for 1939 were $238,660.22, or approximately $1.02 per share of outstanding common stock after deducting annual dividend of $5.00 paid per share of outstanding preferred stock. Working capital was materially increased. Current assets exceed current liabilities at a ratio of four and one-half to one.

✦ ✦ ✦

A NUMBER of important improvements in plant equipment, methods and processes have been installed, sales and technical staffs enlarged, and branch offices opened in several key cities.

✦ ✦ ✦

ACCORDING to **Robert J. Aitchison,** president, the company is in an excellent position so far as its basic rare metal ore requirements are concerned. Inventories of ores have been sharply increased.

Learn about PARALAN

Paralan will give your finished wire and wire products protection from atmospheric corrosion in the mill and in shipping. Paralan-coated wire can be spot welded or soldered without cleaning. Also, Paralan leaves surfaces in good condition for all types of finishes—enameling, japanning, lacquering, plating, etc.

Write for further information. We may be able to solve your difficulties.

AMERICAN LANOLIN CORP.
LAWRENCE, MASSACHUSETTS

"STANDARD WIRE DRAW"
FOR HIGH-LOW CARBON, BRIGHT, COLD HEADING WET WIRE DRAWING

● Lower die costs ● Better finished wire
● Lubricants specially adapted for drawing on high speed machines

EXPERIENCED SERVICE MEN WILL DEMONSTRATE THE MERIT OF OUR PRODUCTS

STANDARD INDUSTRIAL COMPOUNDS CO.
4600 Ferdinand St. Chicago, Ill.

INVENTIONS — PATENTS

Interesting booklet, **General Information Concerning Inventions and Patents** and **Schedule of Government and Attorneys' Fees,** sent free on request. Simply ask for "booklet" and "fee schedule".

Lancaster, Allwine & Rommel
Registered Patent Attorneys
438 Bowen Bldg. Washington, D. C.

Memo to Wire-Makers:

CUPRODINE creates a dense, bright, tight, uniform copper coating in a minimum of time. It is used in a simple immersion process.

RODINE, in the pickling bath, saves acid and metal, minimizes brittleness, lowers pickling costs.

RODINE more than pays its way.

American Chemical Paint Co.
Box 306, AMBLER, PENNA.
Detroit, Mich. Walkerville, Ont.

Cut Waste with Better Die Box Action

You can get much better tonnage per pound of wire drawing compound used, if you use finely divided, anhydrous

MAGNUS STEEL WIRE DRAWING COMPOUNDS

They insure better and smoother coating which gives the improved rolling action in the die box and boosts production of top quality wire. There is a type of Magnus Wire Drawing Compound to meet every special requirement you have in drawing not only steel, but wires in all other metals.

Investigate these specially compounded materials.

GET THE FACTS

Ask for performance data from mills producing wire similar to yours and see what these compounds are achieving in service.

MAGNUS CHEMICAL CO.
188 South Ave., Garwood, N. J.

Magnus CLEANERS

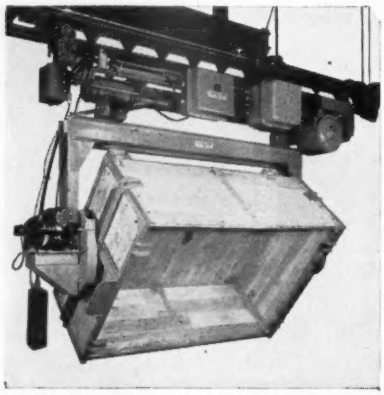
Full Rotation Box Grab and Tramrail Carrier

THE Cleveland Tramrail Division of The Cleveland Crane & Engineering Co., Wickliffe, Ohio has developed a new full-rotation box grab and tramrail carrier which is suitable for conveying materials in a wide range of industries.

✦ ✦ ✦

BOXES may be turned to any position by means of a gear-motor drive. If desired a complete turn may be made. The grab is especially desirable where gradual dumping is required. The box may be raised or lowered as desired. A twin hoisting unit is used.

✦ ✦ ✦



BOXES are securely clamped in position by means of a hand-wheel located at end opposite the gear-motor rotating mechanism.

✦ ✦ ✦

THE unit illustrated is for boxes size 48 inches wide, 72 inches long and 30 inches deep, and will carry 2000 pounds of materials. It has a full load hoisting speed of 20 feet per minute and travel speed of 150 feet per minute. The push-button station is used for all operations, including turning. Although the box illustrated is wood, steel boxes have been handled with equal success.

✦ ✦ ✦

THIS grab is of great advantage for transporting boxes of materials from storage to mixing machines and in this connection many boxes may be used with one Cleveland Tramrail grab and carrier. The grab may also be used

GET COMPLETE LUBRICATION WITH NOPCO 2261

Nopco 2261 is a new departure in tube drawing compounds. Its extremely high neutral fat content—50%, insures correct and adequate lubrication, even in cases where heavy draws with large reductions are made.

Nopco 2261 is highly versatile, being equally effective in the wet drawing of:

Any size copper or brass tubes.
Large copper or brass shells, rivets, etc.
Heavy copper or brass wire.

Nopco 2261 is a superior lubricant. It is formulated of high titre vegetable fats—is readily soluble. It may be depended on to aid production and to effect economies in your drawing operations.

Write for Technical Data Bulletin, or better still, order enough for a trial—see for yourself.

REG. U. S. NOPCO PAT. OFF.
NATIONAL OIL PRODUCTS CO.
HARRISON, N. J.
BOSTON • CEDARTOWN, GA. • CHICAGO • SAN FRANCISCO

WILLEY'S SIZING, EXTRUSION WIRE DRAWING DIES

A TUNGSTEN Carbide Metal that will produce a super fine finish with intensive resistance to abrasion.

Your assurance for accuracy and long life production at high speeds.

Sales engineers in principal cities.

Write for Catalogue showing latest price reduction.

WILLEY'S CARBIDE TOOL CO.
MANUFACTURERS AND SPECIALISTS IN
TUNGSTEN CARBIDE TOOLS
1340 W. VERNOR HIGHWAY • DETROIT, MICHIGAN

Hy-Carbo Steel Co.
Est. 1917
✦ ✦ ✦
HIGH GRADE CUSTOM WIRE DRAWING
Less Ton Lots A Specialty
✦ ✦ ✦
LOWELL, MASS.

Continuous Straightening and Cutting Machinery
With
FLYING SHEAR
for round and shaped wire.
✦ ✦ ✦
THE HALLDEN MACHINE COMPANY
THOMASTON CONNECTICUT

Largest Stocks in U. S. A.
VIANNEY
Famous Wire Drawing Diamond Dies
250 E. 43rd St., New York

CLEVELAND TRAMRAIL
Division of
THE CLEVELAND CRANE & ENGINEERING CO.
WICKLIFFE, OHIO
Leading manufacturers of
OVERHEAD MATERIALS HANDLING EQUIPMENT
for the Wire and Wire Products Industry

"THE SHIFTWEIGHT"
TILTING WIRE REEL
One man loading reel = for wire coils up to 300 pounds.
MOSLO MACHINERY, INC.
CLEVELAND, OHIO

for handling crates or machinery, etc., which it is desired to have turned or rolled over. Grabs can be furnished for smaller or larger boxes and for loads up to 5 tons (including box, grab, and material).

✦ ✦ ✦

Standard for Magnet Wire Specifications

(*Continued from Page 214*)

IN setting up the "specifications for heavy-walled round copper magnet wire" the Technical Committee recognized that neither the technology of manufacture nor variation in use of this type of wire is static. Therefore, the committee will continue to keep itself informed of latest improvements and will not hesitate to revise the specifications if and when the need arises.

✦ ✦ ✦

Charles Arthur White

IT is with profound regret that we announce the death of **Charles Arthur White,** Secretary-Treasurer of the Leeds and Northrup Company. He died on March 2 at Germantown Hospital in Philadelphia, after a 2-weeks illness. He was fifty-eight years old. His wife, the former Grace Myers, and his son, Charles, Jr., survive.

✦ ✦ ✦

MR. WHITE was born near Poughkeepsie, N. Y., was associated with Adriance Platt & Company, manufacturers of farm machinery, from 1902 to 1914, and from 1915 to 1920 was cost accountant, later purchasing agent, of the Hero Manufacturing Company of Philadelphia.

✦ ✦ ✦

HE joined the Leeds and Northrup Company as chief accountant in 1920, soon accepted the responsibilities of an expanding accounting department, and by 1928 was Secretary-Treasurer.

MOSSBERG
PRESSED STEEL CORP.
ATTLEBORO, MASS.
STEEL REELS AND SPOOLS

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3—Nilson No. 1, 3 & 4 4 Slide Wire Machines
2—Baird No. 3 & S3F 4 Slide Wire Machines
7—Waterbury Step Cone Wire Drawing Machines
1—Two Spindle Bull Block Motor Driven
6—Lewis Welding Wire S & C Machines M. D.
2—Shuster Shaped Wire S & C Machines ½" & ¾"
8—Shuster Round Wire S & C Machines 1/32"-½"
Wanted: Tack Making Machinery. All Sizes.
NATIONAL MACHINERY EXCHANGE
128-138 MOTT ST. NEW YORK, N. Y.

BRODEN
Wire Mill and Cold Rolling Equipment
Broden Construction Co.
11730 Harvard Ave.
CLEVELAND, OHIO

TANKS
FOR EVERY MILL OPERATION
CLEANING—PICKLING—PLATING.
LEAD LINING RUBBER LINING
THE HAUSER-STANDER TANK CO.
CINCINNATI, OHIO

This is an invitation for you to become a member of The Wire Association.
The Annual Dues are $10.00
✦ ✦ ✦
The 1940 Convention will be held in October at Cleveland, O.
✦ ✦ ✦
For Details Address
Richard E. Brown, Secretary
The Wire Association
300 Main St. Stamford, Conn.
Stamford Trust Co. Bldg.

ZINC STRIP AND WIRE
THE PLATT BROS. & CO.
WATERBURY, CONN.

Designers and Builders of Gas-Fired Heat Treating Furnaces for Ferrous and Non-Ferrous Wire.
SURFACE COMBUSTION CORPORATION
Main Plant and General Offices—Toledo, Ohio

RUESCH
Machinery For
Wire, Tube, and Brass Mills
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DIAMOND CARBIDE
DIES
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WIRE DIE CORPORATION
19 W. 34th St. New York

WIRE DRAWING MACHINERY AND EQUIPMENT
Rod Frames — 16" Frames, 8" Frames — Take-Up Frames, Wire Pointers — Puller Tongs.
General Castings for Wire Mill use.
Circulars on Request.
E. J. SCUDDER FOUNDRY & MACHINE CO.
TRENTON, N. J.

FOR DIAMOND AND CARBIDE WIRE DRAWING DIES SEE
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275 Seventh Ave., New York, N. Y.

Wire Drawing Diamond Dies
COCHAUD
WIRE DIE CORPORATION
300 W. 56th St., NEW YORK
Tel. Col. 5-1340

Wire Association Elects Officers

(*Continued from Page 202*)

THE meeting this year will consist of three or four informal talks by well-known wire mill men, each talk relating to a different development in current practice and the bulk of the time will be spent for discussions on the subjects presented.

✦ ✦ ✦

THERE will be a plant inspection in the afternoon for wire mill production men and operating executives only, and in the evening a dinner tendered by the Firth Sterling Steel Company to all members of the Wire Association and guests who may attend this Regional Meeting.

✦ ✦ ✦

AT this meeting there will be no registration fee or expense of any kind incurred by those attending as the Firth Sterling Steel Company is sponsoring the meeting. Notices of the date and program will be mailed out in ample time to reach the members of the Association desiring to attend.

✦ ✦ ✦

E. W. CLARK
Mechanical Engineer, Wire and Cable Section, General Electric Co., Schenectady, N. Y., Vice President, The Wire Association.

ROYLE
PATERSON N J
BUILDING EXTRUDERS SINCE 1880
The pioneer line of extruding machines for wire covering, tubing, straining.
JOHN ROYLE & SONS
PATERSON, N. J.
British Agency: James Day (Machinery) Ltd., Sentinel House, Southampton Row, London, W. C. 1, England

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For WIRE, RUBBER, TEXTILES, PAPER, Etc.
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PROVIDENCE, R. I.

MANUFACTURERS OF
WIRE BRAIDING—SPOOLING—TAPING
WINDING AND SPECIAL MACHINES
SINFRA WIRE COVERING MACHINES
FIDELITY MACHINE CO.
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FLASH
BAKER
24 Installations to Date
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We manufacture Electric Spot Welders from ¼ to 500 K.V.A. We also make standard and special Transformers of all kinds. A.C. Arc Welders from 100 to 400 Amps.
Eisler Engineering Co.
CHAS. EISLER, Pres.
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Newark, New Jersey

WIRE, WIRE ROPE AND ELECTRIC CABLE MACHINERY
THOMSON-JUDD
WIRE MACHINERY COMPANY
SUBSIDIARY OF
THOMSON-GIBB ELECTRIC WELDING COMPANY
LYNN, MASSACHUSETTS
WRITE FOR CATALOGUE

UNIVERSAL WIRE REEL
Quickly and easily adjusted to any angle within 90 degrees. Cut shows one angle.
Write for circular R
THE F. B. SHUSTER CO.
New Haven, Conn.
Straightener Specialists Since 1866

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THE ANNUAL MEDAL AWARD

OF THE

WIRE ASSOCIATION

FOR THE MOST MERITORIOUS PAPER ON
WIRE MANUFACTURE OR FABRICATION DURING THE YEAR

ALL members of the Wire Association are cordially invited to submit technical papers either for publication in "WIRE & WIRE PRODUCTS" during the year or for presentation before the Annual Wire Association Meeting at Cleveland, October 21-25, 1940.

✦ ✦ ✦

FOR 1940 and subsequent years a medal will be awarded in each of the two major divisions of the activities of the Association, to the papers coming nearest to the requirement set forth above.

✦ ✦ ✦

CONSIDERATION for the Medal Awards is not limited to the papers presented at the Annual Meeting, but is given to all papers submitted by members and published in "WIRE & WIRE PRODUCTS" during the year.

✦ ✦ ✦

SELECTION of papers to be presented at the Annual Convention rests in the hands of the Joint Programme Committee of the Wire Association.

✦ ✦ ✦

ALL papers submitted become the property of the Wire Association, and the Board of Directors constitutes the Committee on Awards.

✦ ✦ ✦

ADDITIONAL information may be obtained by addressing:

RICHARD E. BROWN,
SECRETARY, THE WIRE ASSOCIATION
STAMFORD TRUST CO. BLDG., STAMFORD, CONNECTICUT

WHERE TO BUY

For more complete information, consult the annual Directory, Index & Buyers' Guide.

ABRASIVES—
Norton Co., Worcester, Mass.

AIR DRAW FURNACES—
Carl-Mayer Corp., The,, Cleveland, Ohio.

ANNEALING POTS AND BOXES—
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.

ANTI-RUST—Compound
Magnus Chemical Co., Garwood, N. J.
National Oil Products Co., Harrison, N. J.

ARMORING EQUIPMENT—
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

AUTOMATIC SPARK TESTING EQUIPMENT—
Entwistle, James L., Pawtucket, R. I.

BAKERS—Flash
Morrison Engineering Corp., Cleveland, O.

BAKERS—Hi-Speed
Carl-Mayer Corp., The,, Cleveland, Ohio.

BAKERS—Rod and Wire
Carl-Mayer Corp., The,, Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Morrison Engineering Corp,, Cleveland, O.
Moslo Machinery, Inc., Cleveland, O.
Ross Engineering Corp., J. O., New York, N. Y.

BOBBINS—Braider and Wire Weaving
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

BORON CARBIDE—
Norton Co., Worcester, Mass.

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

CEMENT FLOOR CLEANER—
Magnus Chemical Co., Garwood, N. J.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CHEMICALS—Cleaning
American Chemical Paint Co., Ambler, Pa.
Magnus Chemical Co., Garwood, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

CLEANERS—Hand and Metal
Magnus Chemical Co., Garwood, N. J.

CLEANING & PICKLING EQUIPMENT—
Broden Construction Co., Cleveland, O.
Cleveland Tramrail div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Hauser-Stander Tank Co., Cincinnati, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CLOTH TESTERS—
Scott, Henry L., Co., Providence, R. I.

COATING—Protective
American Lanolin Corp., Lawrence, Mass.
National Oil Products Co., Harrison, N. J.

COILERS—Sheet, Strip and Wire
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
H. J. Ruesch Machine Co., Newark, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

COILERS AND SPOOLERS FOR INSULATED WIRES—
Entwistle, James L., Pawtucket, R. I.

COMPOUNDS—Wire Drawing
Magnus Chemical Co., Garwood, N. J.
National Oil Products Co., Harrison, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

COPHOLDERS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.

CRANES—Wire Mill
Cleveland Tramrail div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUSTOM WIRE DRAWING—
Hy-Carbo Steel Co., Lowell, Mass.

CUTTERS—Wire
Porter Co., The, H. K., Everett, Mass.

CUTTING TOOLS—Carbide
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Vascoloy-Ramet Corp., North Chicago, Ill.

DIAMOND POWDERS—
Rusch Wire Die Corp., New York, N. Y.

DIAMOND TOOLS—
Rusch Wire Die Corp., New York, N. Y.

DIES—Diamond
Cochaud Wire Die Co., New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Lead Extrusion
John Robertson Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
Carboloy Co., Inc., Detroit, Mich.
Cochaud Wire Die Co., New York, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Rod and Tube Drawing
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Tantalum Carbide
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.

DIES—Tungsten Carbide
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DRAW BENCHES—
H. J. Ruesch Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Standard Machinery Co., Providence, R. I.
Vaughn Machinery Co., Cuyahoga Falls, O.

DRUMS—Flange Steel
Stevens Metal Products Co., Niles, O.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

ENGINEERS—Consulting Wire Mill
Hartley, George D., Worcester, Mass.
Lewis, Kenneth B., Worcester, Mass.

EQUIPMENT—Insulation Testing
Entwistle, James L., Pawtucket, R. I.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FLASH BAKERS—
Morrison Engineering Corp., Cleveland, O.

FURNACES—Annealing
Carl-Mayer Corp., The,, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Automatic
Carl-Mayer Corp., The,, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Brazing
Electric Furnace Co., Salem, O.
Firth-Sterling Steel Co., McKeesport, Pa.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Electric
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Hardening and Tempering
Carl-Mayer Corp., The,, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Lead Melting
Electric Furnace Co., Salem, O.
John Robertson Co., Brooklyn, N. Y.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Non-Oxidizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Normalizing
Carl-Mayer Corp., The,, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Salt Bath
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The,, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Morrison Engineering Corp., Cleveland, O.
Surface Combustion Corp., Toledo, Ohio.

GEARS—Wire Mill
Farrel-Birmingham Co., Inc., Ansonia, Conn.

GRINDERS—Roll
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Norton Co., Worcester, Mass.

HI-SPEED BAKERS—
Carl-Mayer Corp., The,, Cleveland, Ohio.

HOISTS—Electric Travelling
Cleveland Tramrail div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

INHIBITORS—
American Chemical Paint Co., Ambler, Pa.
National Oil Products Co., Harrison, N. J.

INSTRUMENTS—Electrical
Entwistle, James L., Pawtucket, R. I.

LATHES—Die Reaming
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Magnus Chemical Co., Garwood, N. J.
National Oil Products Co., Harrison, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

LUBRICANTS—Wire Drawing
Magnus Chemical Co., Garwood, N. J.
National Oil Products Co., Harrison, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

MACHINERY — Armoring (Cable, Wire Hose)
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
John Robertson Co., Brooklyn, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Brazing
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Bunching
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Electric
American Insulating Mach'y. Co., Phila., Pa.
Entwistle, James L., Pawtucket, R. I.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Gibb Electric Welding Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Chain Making
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Closing
New England Butt Co., Providence, R. I.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

WHERE TO BUY, Continued

MACHINERY—Coilers
Broden Construction Co., Cleveland, O.
Entwistle, James L., Pawtucket, R. I.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Morgan Construction Co., Worcester, Mass.
New England Butt Co., Providence, R. I.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Copper Wire Drawing and Rolling
Farrel-Birmingham Co., Inc., Ansonia, Conn.
H. J. Ruesch Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Covering Wire
Fidelity Machine Co., Philadelphia, Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Cutting
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Hallden Machine Co., Thomaston, Conn.
Lewis Machine Co., The, Cleveland, O.
Moslo Machinery, Inc., Cleveland, O.
National Machinery Exchange (Used), New York, N. Y.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Die Making
Firth-Sterling Steel Co., McKeesport, Pa.

MACHINERY—Edging
Standard Machinery Co., Providence, R. I.

MACHINERY—Enameling
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Extruding
John Robertson Co., Brooklyn, N. Y.
Royle, John & Sons, Paterson, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Flat Wire
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Forming
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Galvanizing Wire
Broden Construction Co., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Gang Winders
Fidelity Machine Co., Philadelphia, Pa.
H. J. Ruesch Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Philadelphia, Pa.

MACHINERY—Lead Encasing
John Robertson Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
John Robertson Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Magnet Wire
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Material Handling
Cleveland Tramrail div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

MACHINERY — Measuring Wire & Cable
Durant Mfg. Co., Milwaukee, Wis.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works Co., Chicago, Ill.
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Panning
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Pointing
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Rod Mill
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Rolling Mill
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
H. J. Ruesch Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Syncro Machine, Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Rubber for Insulating Wire
Farrel-Birmingham Co., Inc., Ansonia, Conn.
National Rubber Machinery Co., Akron, O.
Royle, John & Sons, Paterson, N. J.

MACHINERY—Rubber Strip Covering
Farrel-Birmingham Co., Inc., Ansonia, Conn.
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
Farrel-Birmingham Co., Inc., Ansonia, Conn.
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Screw Wire
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y. Co., Phila., Pa.
Broden Construction Co., Cleveland, O.
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
H. J. Ruesch Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spooling
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, O.
Hallden Machine Co., Thomaston, Conn.
Lewis Machine Co., The, Cleveland, O.
Moslo Machinery, Inc., Cleveland, O.
National Machinery Exchange (Used), New York, N. Y.
H. J. Ruesch Machine Co., Newark, N. J.
F. B. Shuster, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Stranding
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Swaging
National Machinery Exchange (Used), New York, N. Y.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine, Rahway, N. J.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Testing
Entwistle, James L., Pawtucket, R. I.
Scott, Henry L., Co., Providence, R. I.

MACHINERY—Testing Size of Wire
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Testing—Spring
Standard Machinery Co., Providence, R. I.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
H. J. Ruesch Machine Co., Newark, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Welding Wire
Eisler Engineering Co., Inc., Newark, N. J.
Micro Products Co., Chicago, Ill.
F. B. Shuster Co., New Haven, Conn.
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Winding
American Insulating Mach'y. Co., Phila., Pa.
Entwistle, James L., Pawtucket, R. I.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
American Insulating Mach'y. Co., Phila., Pa.
Broden Construction Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Reactive Wire Drawing, Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Wire Measuring
Durant Mfg. Co., Milwaukee, Wis.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Rope
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

WHERE TO BUY, Continued

MACHINERY—Wire Tinning
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Wood Screw
National Machinery Exchange (Used), New York, N. Y.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

MILLS—Tandem Rolling and Edging
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., The, Torrington, Conn.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.

OILS—Wire Drawing
National Oil Products Co., Harrison, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

OVENS—Industrial
Carl-Mayer Corp., Cleveland, Ohio.
Morrison Engineering Corp., Cleveland, O.
Ross Engineering Corp., J. O., New York, N. Y.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER TESTERS—
Scott, Henry L., Co., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine and Rommel, Washington, D. C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
National Oil Products Co., Harrison, N. J.

PLASTIC TESTERS—
Scott, Henry L., Co., Providence, R. I.

POTS—Lead Melting
Farrel-Birmingham Co., Inc., Ansonia, Conn.
John Robertson Co., Brooklyn, N. Y.

PRESSES—Hydraulic and Mechanical
Farrel-Birmingham Co., Inc., Ansonia, Conn.
John Robertson Co., Brooklyn, N. Y.
Standard Machinery Co., Providence, R. I.

PRESSES—Lead
John Robertson Co., Brooklyn, N. Y.

PULLERS—Wire
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
John Robertson Co., Brooklyn, N. Y.

REACTIVE WIRE DRAWING
Reactive Wire Drawing, Worcester, Mass.

RECORDERS—Fault and Reel
Entwistle, James L., Pawtucket, R. I.

REEL AND TENSION STAND—
Fidelity Machine Co., Philadelphia, Pa.
Moslo Machinery, Inc., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS—Annealing and Stranding
Moslo Machinery, Inc., Cleveland, O.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster Co., F. B., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS AND SPOOLS—Shipping and Shop
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

REELS—Takeoff
Moslo Machinery, Inc., Cleveland, O.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster Co., F. B., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Vulcanizing and Impregnating
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster Co., F. B., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Wire Drawing
Moslo Machinery, Inc., Cleveland, O.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

ROD BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio.
Morrison Engineering Corp., Cleveland, O.
Moslo Machinery, Inc., Cleveland, O.
Ross Engineering Corp., J. O., New York, N. Y.

RODS—Wire—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

ROLL STRAIGHTENERS—
Moslo Machinery, Inc., Cleveland, O.

ROLLS—
Farrel-Birmingham Co., Inc., Ansonia, Conn.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott, Henry L., Co., Providence, R. I.

RUST PROOF COMPOUND—
American Lanolin Co., Lawrence, Mass.

SHEET—Steel
Jones & Laughlin Steel Corp., Pittsburgh, Pa.

SKIN PROTECTOR—
Magnus Chemical Co., Garwood, N. J.

SOAPS—Industrial and Wire Drawing
Magnus Chemical Co., Garwood, N. J.
National Oil Products Co., Harrison, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

SPARK TESTING EQUIPMENT—
Entwistle, James L., Pawtucket, R. I.

SPOOLS—Annealing and Wire Drawing
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Chicago, Ill.

SPOOLS—Shipping and Shop
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

SPOOLS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

STAMPINGS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Brass and Non Ferrous
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Bethlehem Steel Corp., Bethlehem, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Pittsburgh Steel Corp., Pittsburgh, Pa.

STRIP METAL TESTERS—
Scott, Henry L., Co., Providence, R. I.

SWIFTS—Take-off
Mossberg Pressed Steel Corp., Attleboro, Mass.

TAKE-UPS FOR CABLE, HOSE, LEAD PRESSES AND SHEET RUBBER—
Entwistle, James L., Pawtucket, R. I.

TANKS—Acid
Hauser-Stander Tank Co., Cincinnati, O.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TANKS—Lead Lined
Hauser-Stander Tank Co., Cincinnati, O.

TANKS—Pickling
Hauser-Stander Tank Co., Cincinnati, O.

TANKS—Rubber Lined
Hauser-Stander Tank Co., Cincinnati, O.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.

TANKS—Wooden
Hauser-Stander Tank Co., Cincinnati, O.

TENSILE TESTERS—
Scott, Henry L., Co., Providence, R. I.

TESTING INSTRUMENTS—
Entwistle, James L., Providence, R. I.
Scott Co., Henry L., Providence, R. I.

TOOLS—Wire Cutting
Porter Co., The H. K., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS—
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS—
H. J. Ruesch Machine Co., Newark, N. J.

TURKS HEAD—
Standard Machinery Co., Auburn, R. I.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y. Co., Phila., Pa.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Moslo Machinery, Inc., Cleveland, O.

WIRE—Cold Heading
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE DRAWING—High Grade Custom
Hy-Carbo Steel Co., Lowell, Mass.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.

WIRE—Enameled For Coils
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Bethlehem Steel Co., Bethlehem, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Co., Ossining, N. Y.

WIRE—Non Ferrous to Specification For Special Purposes
Hudson Wire Co., Ossining, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Stainless Steel—
Firth-Sterling Steel Co., McKeesport, Pa.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE AND STRIP—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE TESTERS—
Scott, Henry L., Co., Providence, R. I.

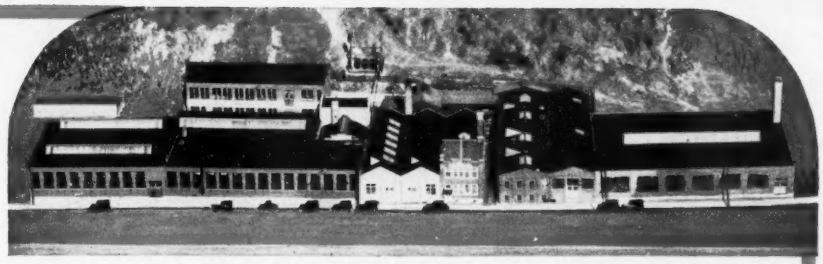
WIRE, WEAVING—Non Ferrous
Hudson Wire Co., Ossining, N. Y.

YARN TESTERS—
Scott, Henry L., Co., Providence, R. I.

HUDCO

SPECIALIZES

WINCO



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FINE BARE WIRES

High Brass, Low Brass, Zinc 99.99+ and High Tensile Zinc, Commercial Bronze, Phosphor Bronze, Pure Tin, Lead, Antimonial Lead, Tinsel Lahns, Silver Plated Copper, False Gold and Copper.

Cadmium, Nickel Silver, 10%, 18%, and 30%; Silver Plated Copper, False Gold and Special Brass and Bronze Alloys to Specification, Metallic Fibre for Packing Purposes, Copper, Bronze, Zinc, Lead and Aluminum.

WIRES FOR METAL SPRAYING

Pure Lead, Lead Alloy, Pure Zinc, Zinc Alloy, Copper, Tin, High Brass, Low Brass, Solder Wire, High Conductivity, Electric Wire.

Cadmium, Nickel Silver, (10%, 18%, 30%); Aluminum, Monel Metal, Phosphor Bronze, Pure Nickel, Commercial Bronze.

"HUDCO" SPECIALLY PROCESSED COPPER WIRE FOR ENAMELLING PURPOSES IS DRAWN FROM SELECTED COPPER, INSURING THE MAXIMUM CONDUCTIVITY. THIS SELECTION PLUS OUR LONG EXPERIENCE AND UNEXCELLED PLANT FACILITIES INSURE OUR CUSTOMER BETTER WIRE AT LOWER COST.

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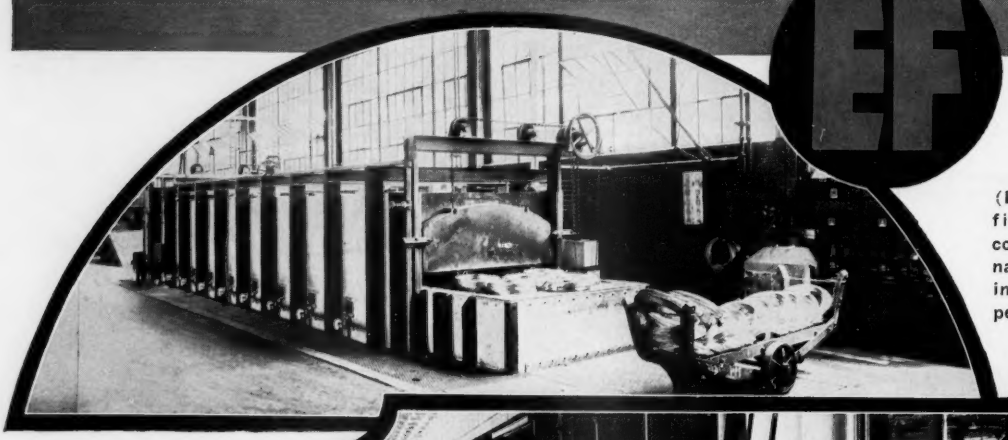
HUDSON WIRE COMPANY
OSSINING, N. Y.

ESTAB. 1902 SUCCESSORS - ROYLE AND AKIN

WINCO AT WINSTED, CONN. PRODUCES LEAKPROOF ENAMELLED WIRE AND OTHER WINCO ENAMELLED AND COVERED WIRES.

WRITE FOR SAMPLES AND PRICES —

WINSTED DIVISION
HUDSON WIRE COMPANY
WINSTED CONNECTICUT



(Left) An E F gas fired continuous conveyor type furnace, clean annealing 5000 lbs. wire per hour.

(Right) An E F special atmosphere electric furnace for bright annealing wire and strip—continuously.

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